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The Selective Utilisation of *Rhizophora mangle* Habitat by Juvenile Reef Fish

by

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DECLARATION

This work has not previously been accepted for any degree and is not currently submitted in candidature for any degree.

Signed

(Candidate)
May 2005

This thesis is the result of my own investigations. Other sources are acknowledged in the text, giving explicit references. A bibliography is appended.

Signed

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Abstract

Recognised as 'Essential Fish Habitat', red mangrove (*Rhizophora mangle)* has received much attention in recent years to assess its nursery function. Research suggests that mangrove habitat contributes significantly to coral reef fish populations. Not all mangrove is utilised to its full capacity by juvenile fish, and it may be that, in terms of fisheries sustainability and enhancement, the use of management resources for mangrove habitat protection could be more judiciously targeted on the basis of preferred habitat use. In order to establish the factors influencing fish distribution in *Rhizophora mangle*, fish populations were studied in a Bahamian tidal lagoon. Biotopic, hydrophysical, structural and biological influences were investigated in natural red mangrove habitat, and by experimental manipulation of artificial mangrove units (AMUs). Reef fish were distributed unevenly over various spatial scales, indicating preferences in some species for particular lagoon biotopes, and various physical and biological characteristics in mangrove prop root habitat. With the exception of tidal flow, other physical attributes such as salinity, pH, dissolved oxygen and water depth had limited influence on fish distribution. In natural mangrove habitat the degree of shade appeared to be the most important factor in attracting fish to mangrove habitat followed by habitat complexity and epiphytic algae biomass. Variations in preference for these attributes between species and size classes suggested that no single attribute was exclusively responsible for a particular locational preference. Experimental manipulations of AMUs indicated a preference for greater shade and root density up to a certain level after which no preference was shown. Preferences varied between species and size classes and also with increased vulnerability to predation. Red mangrove trees perform a number of important functions on tropical and sub-tropical coastlines. They stabilise and protect the coastline against erosion, supply nutrients to other coastal habitats, and provide habitat for many avian and terrestrial species. Prioritising management in mangrove habitat must be done with care, taking into account all of the habitat's functions.

Chapter 1

General Introduction and Aims

1.1 The status of Caribbean fisheries

The fisheries of the Caribbean are in decline. The status of many stocks is unknown but most are probably fully or over exploited (Chakalall 1986, Appeldoorn *et al.* 1987, Mahon 1993, Western Central Atlantic Fishery Commission 1999, Hoggarth 2001). These conclusions are based on reduced catch per unit effort, reduced sizes of fish being caught, fewer numbers of particular species once prevalent in certain locations and a trend towards the consumption of species previously considered poor eating (Appeldoorn *et al.* 1987, Hoggarth 2001).

The Caribbean region is composed of over twenty-five countries and territories. Fisheries around the islands are essentially artisanal in nature, but continental countries generally support larger scale commercial fisheries. Caribbean fish stocks are restricted by the narrow shelf areas that surround the islands and by the limited area of coastal nursery habitat (Appeldoorn *et al.* 1987). Anthropogenic factors such as increasing populations, the lack of other exploitable natural resources, demand by the tourist industry for fish products (Sadovy 1989) and technological advances in fishing techniques (Schirripa *et al.* 1999), have been highlighted as causes for fishery declines.

The number of exploited fish species in the Caribbean has been estimated at anywhere between 140-180 species (Sadovy 1989, Western Central Atlantic Fishery Commission 1997). However, as many species caught remain unidentified, this figure could be much greater. Area 31, the Food and Agriculture Organisation (FAO) designated Atlantic Western Central region encompasses the Bahamas, the Caribbean

and Gulf of Mexico and East coast of the United States to North Carolina (Figure 1.1).

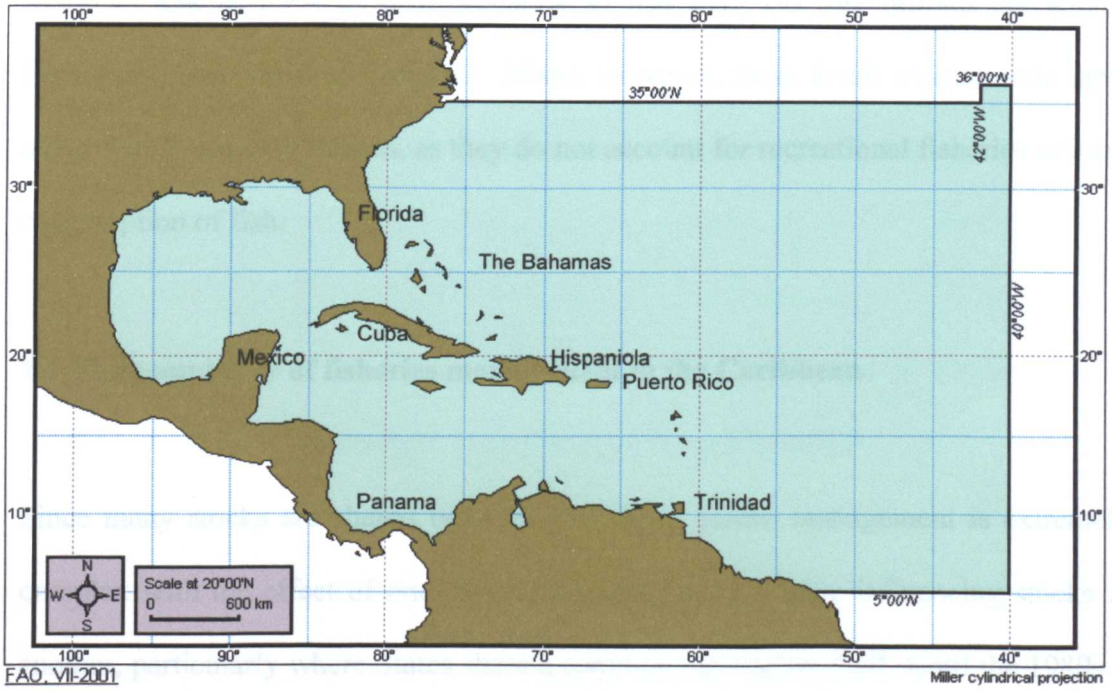

Figure 1.1: Atlantic Western Central fishing capture and production area 31, modified from FAO Fisheries Department. Source - www.fao.org/fi/statist/statist.asp.

Of the species recorded within this area, the greatest components of the catch are the small pelagic species like herring, sardines, anchovy and in particular Gulf and Atlantic Menhaden (Western Central Atlantic Fishery Commission 1997). Demersal fish also support important fisheries in particular in the artisanal fishery using traps, spears, and hooks and lines.

Total fish landings in area 31 from 1950 – 1994 peaked in 1984 at 2.5 million tonnes and then dropped to 1.5 million tonnes in 1992. Capture production peaked once again in 1994 at 2.1 million tonnes, and since then, catches have fluctuated between 1.6 and 1.82 million tonnes with a production of 1.69 million tonnes in 2001. Fishing

is of considerable economic importance in the Caribbean responsible for anywhere between 4 – 10% of GDP for individual countries or territories. For the Bahamas, this figure is less at 1.9% of GDP equating to just over US $92 million per annum (Bahamas Department of Fisheries 2004a). However, these levels of economic input are probably under estimated, as they do not account for recreational fisheries or local consumption of fish.

1.2 The complexity of fisheries management in the Caribbean

Since many stocks are shared between Caribbean States, management is extremely complex with the effect of one country's management regime influencing stocks in another, particularly where States share a common submarine shelf. Until the 1980s it was widely accepted that fish larval distribution followed the prevailing currents from East to West through the Lesser Antilles into the Caribbean Sea. However, Appeldoorn *et al.* (1987) presented a more complex view of larval dispersal suggesting that a system of gyres and eddies may in fact lead to the retention of larvae in many areas following spawning. Furthermore, knowledge of the migration and distribution of adult fish is still limited. The necessity to manage reef fisheries is further exacerbated by the life histories of many species, which leave many reef fish vulnerable to over exploitation. For example, many targeted species are slow growing and long lived, and become sexually mature late in life. Moreover, many species spawn in massive aggregations in the same location year after year, and fishermen have traditionally targeted these aggregations, limiting future reproductive output.

Perhaps the greatest restriction to the successful management of fish stocks in the Caribbean is the lack of reliable and consistent data on catch and effort (Munro 1973).

Unfortunately little has occurred to improve this situation in the last 30 years, and data limitations have been highlighted more recently by Hoggarth (2001). In his analysis of the state of fish stocks in the Caribbean Community (CARICOM) and Caribbean Forum of African, Caribbean and Pacific States (CARIFORUM) countries Hoggarth utilised limited qualitative catch per unit effort data to determine the status of the fisheries (Table 1.1).

Table 1.1: Status of fish stocks in CARICOM and CARIFORUM countries based on limited catch per unit effort data. Modified from Hoggarth (2001).

Stock Status	Recent Effort Levels	Recent Catches	Countries
Good	Increasing or stable	Still increasing	Bahamas, Guyana
Poor	Levelled off	Levelled off	Grenada, Trinidad and Tobago
Poor	Increasing	Levelled off	St. Vincent and The Grenadines, Suriname
Poor	Levelled off	Declining	Belize, Barbados, Dominican Republic, Haiti, Jamaica
Very Poor	Declining	Declining	Antigua and Barbuda, St. Kitts and Nevis

1.3 Fisheries management and restoration efforts

Given the shared nature of fish stocks, a multi-national approach to management is necessary, but to date coordinated efforts have been limited. Overall fish stocks have continued to decline despite efforts to manage the fisheries. These efforts have included the Western Central Atlantic Fisheries Commissions (WCAFC) Code of Conduct for Responsible Fisheries (1995). This document sought to establish standards based on international law, biological, technological, social, economic, environmental and commercial aspects for responsible fishing and fisheries activities. It also attempted to provide guidance to assist in the formulation of international agreements between islands and states with shared stocks, and promote the protection of living marine resources and their habitats.

1.4 Critical fisheries habitat

The WCAFC code of conduct went further in outlining the importance of protecting certain biotopes as critical fisheries habitats such as wetlands, mangroves, reefs and lagoons which were earmarked for particular protective efforts to avoid their destruction, degradation and other significant impacts which may threaten the health of fisheries resources. The loss of these habitats has also been recognised by the United States Congress as " the greatest long-term threat to the viability of commercial and recreational fisheries", and through the Magnuson-Stevens Act mandated the identification of "Essential Fish Habitat" for its protection, conservation and enhancement.

The destruction of coastal habitats which may act as nursery grounds for juvenile reef fish has been highlighted as a potential cause for stock declines (Appeldoorn *et al.* 1987, Sadovy 1989). Nevertheless, the importance in fisheries terms of these habitats such as seagrass beds and particularly of the red mangrove (*Rhizophora mangle*) prop root habitat still remains controversial despite numerous studies of their fisheries function.

1.5 The fisheries function of red mangrove habitat

Rhizophora mangle habitat has received much attention in recent years as the debate over its function as a nursery habitat for juvenile reef fish has become of increasing importance, particularly with development pressure in the coastal zones of many tropical islands throughout the world. *R. mangle* forests have been described as important coastal habitats for a number of reasons including coastal protection and sediment stabilisation (Odum and McIvor 1990). Moreover, epiphytic algae growing on submerged prop roots provides an important food source for herbivores (Parrish 1989). Leaves which fall from trees are broken down and transported in the water column or via transferral through the food web to other coastal ecosystems, (Odum and Heald 1972, Robertson and Duke 1990). A number of researchers have described red mangrove as a nursery habitat for commercially important finfish and shellfish (Thayer *et al.* 1987, Robertson and Duke 1987, Laegdsgaard and Johnson 1995, Nagelkerken 2000, Nagelkerken *et al.* 2000a, Nagelkerken *et al.* 2000c, Mumby *et al.* 2004). Thayer *et al.* (1987) compared fish populations in mangrove habitat and adjacent fringing seagrass areas in South Florida and concluded that mangrove harboured a greater density and biomass of juvenile fish of which several species

were of commercial and recreational importance. In Moreton Bay, Australia, a majority of commercially important species were found in mangrove habitat, compared to seagrass which had relatively few species of economic importance (Laegdsgaard and Johnson 1995). Nagelkerken (2000) sampled a series of shallow water bay habitats including mangrove, seagrass and algal beds and made comparisons with deeper reef habitats concluding that shallow bay biotopes constituted important juvenile fish nurseries. In contrast, the role of mangrove as nursery grounds for coral reef fish was found to be insignificant in the Solomon Islands (Blaber and Milton 1990). Nagelkerken and van der Velde (2003) noted that the utilisation of mangrove and seagrass habitat by juvenile reef fish is especially evident in the Caribbean.

In most studies the nursery function of mangroves and other shallow water habitats has been inferred from highly skewed juvenile size class frequencies, and the limited number of juveniles found on reefs adjacent to the sampled habitats. However, Beck *et al.* (2001) cautioned against this inference and suggested that, in order for a habitat to be considered a nursery, there should be a net contribution of juveniles to the adult population. Moreover, Gillanders *et al.* (2003) stressed that there is limited evidence of connectivity between juvenile and adult habitats for many species, noting that it is very difficult to sample fish movements because of the large spatial scales at which movements may occur and the fact that many movements may be episodic, and therefore, studies would be dependent on being in the right place and the right time.

Different size classes of fish in different habitats may infer a systematic movement from one biotope to another and perhaps from juvenile to adult habitat. But many

studies fail to consider other possible influences on size class distributions such as local fishing effort, predation, and variable growth rates in different habitats. Exceptions to this are Mumby *et al.* 2004 who considered direct and indirect fishing pressure and habitat structure influences, and Cocheret de la Morinière *et al.* (2002) who took account of food availability in growth rate variability between habitats and spawning seasons of the species being sampled. The only means of determining the true contribution of a particular juvenile habitat to the adult population is through tagging and recapture studies. Yet, these studies are often problematic because of low recapture success, and the difficulty of tagging small marine organisms (Gillanders *et al.* 2003).

Nevertheless, evidence is convincing that mangroves and other shallow water biotopes such as seagrass and algal beds play an important nursery role for a number of juvenile reef fish (Nagelkerken *et al.* 2000a, Nagelkerken and van der Velde 2002, Cocheret de la Morinière *et al.* 2002, Mumby *et al.* 2004). Nagelkerken *et al.* (2001) have compared juvenile fish population in bays both with and without mangrove and seagrass habitat and found many species which would normally utilise these habitats to be absent. Furthermore, Nagelkerken *et al.* (2002) found similar results whilst comparing fish populations around islands with and without mangrove and seagrass. Eleven out of seventeen species sampled were absent or in low densities on the reefs adjacent to islands which had no seagrass or mangrove habitat. It was concluded from both these studies that, for some species, these biotopes are obligate nursery habitats. Cocheret de la Morinière *et al.* (2002) studied juvenile reef fish in both seagrass and mangrove habitat, and by recording relative density distributions of the size classes of several species they identified three types of post settlement life cycle migrations to

adjacent reef habitat, noting that the mean size of fish present on the reefs were either larger than, or corresponded to, the total length at which the fish reached sexual maturity. In Papau New Guinea, Birkeland and Amesbury (1988) compared the influence of adjacent habitats on coral reef fish, and found that densities of juvenile fish were several times greater on reefs near mangrove and seagrass habitat compared to isolated reefs. Likewise, in Belize, Mumby *et al.* (2004), found that the presence of mangrove strongly influenced the biomass of reef fish on adjacent reef areas, a number of species increasing significantly compared to sites with no mangrove habitat. Parrish (1989) suggested that because mangroves cover extensive areas of the coast they may intercept fish larvae more efficiently than coral reefs, and that it may be adaptive for fish to settle in nursery habitats where there is less predation, and to migrate to coral reefs once they reach adulthood. Moreover, predation on juvenile fish on coral reefs is thought to be particularly intense, and the protection afforded by mangrove prop roots may provide small fish the opportunity for increased survival.

There is little doubt that mangrove habitat plays a significant role in the life history of many reef fish species in the Caribbean region. Some investigators have noted the heterogeneous distribution of finfish and shellfish species within a particular habitat (Nagelkerken 2000, Stoner 2003). Indeed, Stoner (2003) warns that the existence of habitat commonly thought to provide all the necessary physical and biological attributes for an ideal nursery habitat does not necessarily mean that the habitat will be used as such. He concluded that hydrographic influences have contributed most to the distribution of Queen Conch off the Exuma Cays in the Bahamas. Nagelkerken and van der Velde (2002) suggested that influences on the density and distribution of fish may include; the amount and the duration of planktonic larvae and hydrographic

influences on these larvae. Furthermore, following settlement, predation, resource competition, migration and habitat complexity may play a part. In Moreton Bay, Queensland, Australia, Blaber and Blaber (1980) proposed that turbidity had the most significant influence over the distribution of juvenile fish, finding greater abundances of juveniles in turbid conditions. They suggested that this preference may have been related to reduced predation pressure or possibly food supply. Nagelkerken *et al.* (2000a) found the opposite trend with fewer fish in turbid waters of Spanish Water Bay in Curaçao, but a greater abundance of the predator *Sphyraena barracuda.* However, they did determine positive influences of water depth, habitat complexity and shelter on juvenile fish distribution. Rooker and Dennis (1991) proposed that although there was evidence that lunar periodicity could influence the abundance and distribution of adult coral reef fishes, in particular at spawning times, there was a lack of information on the influence of lunar phase in other habitats. They investigated the effect of this on fish inhabiting red mangrove habitat in Puerto Rico, but concluded that lunar periodicity had no obvious affect on species abundance. Laegdsgaard and Johnson (2001) hypothesised that structure, predation risk and food availability were the main influences on juvenile fish distribution in nursery habitat, testing these with laboratory and field experiments on three bay species. They found that habitat preferences were species specific and that some species were attracted to shelter with greater food availability, whilst others were attracted to structure which afforded the best protection from predators. Ultimately a complex structure, which provided maximum food availability and survivorship for specific species, was selected. Cocheret de la Morinière *et al.* (2004), determined that habitat preference was also species specific, and identified varying relationships between a small number of

diurnal and nocturnal fish species, and preferences to various shades and structural complexity.

The utilisation of specific areas of mangrove prop root habitat, whether it is the result of passive larval transport or through active selection, could focus management of these systems where resources are limited. Furthermore, knowing what influences the distribution of juvenile fish within this habitat may also help optimise restoration efforts in areas which have been damaged through natural and anthropogenic impacts.

1.6 Background to study area

1.6.1 The geography of the Bahamas

The Bahamas form an archipelago in the tropical West Atlantic north of the Greater Antilles and southeast of Florida in the United States of America. Covering an area of 13 868 km^2 with a total land and sea area of approximately 295 000 km^2 the Bahamas consists of over 3 000 low lying carbonate islands, cays and rocks (Figure 1.2). The island territory extends from Grand Bahama on the Little Bahama Bank at 27.5°N, 1 126 km southeast to Great Inagua (20°N), just north of Haiti.

The northern and central islands are located on two vast carbonate platforms averaging 10m in depth. The Little Bahama Bank is located in the northern Bahamas while the Great Bahama Bank begins approximately one hundred km south of the Little Bahamas Bank extending to the south and southeast. These Banks are separated by the Northwest and Northeast Providence Channels, and the Great Bahama Bank is

split by two deep water channels. The first of these channels is the Tongue of the Ocean (approximately 1500 – 1800 m deep) which separates Andros Island from New Providence and the Exuma Cays. The second is the Exuma Sound which is similar in depth to the Tongue of the Ocean, and forms a deep area to the east of the Exumas.

The islands of the Bahamas are located for the most part on the northern and eastern margins of the extensive platforms of the Bahama Banks. In general, the coastal waters of the islands and cays are warm and clear, lacking any influence from rivers or other terrestrial run-off. In contrast, the interiors of the platforms are generally turbid due to tidal circulation, and are more variable in temperature and salinity (Newell *et al.* 1959).

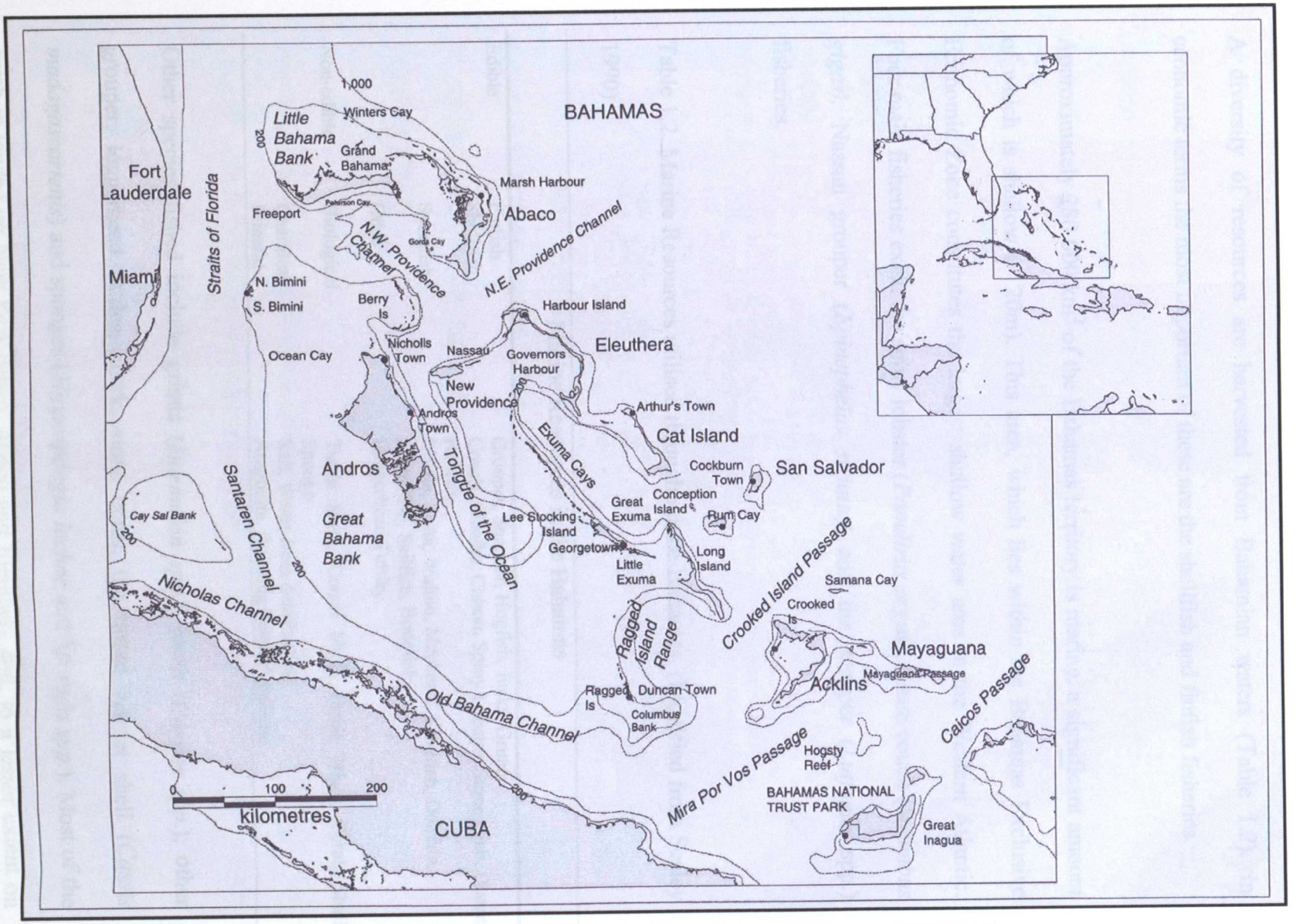

Figure 1.2: Map of the Commonwealth of the Bahamas from Buchan (2000)

1.6.2 Artisanal and commercial fisheries in the Bahamas

A diversity of resources are harvested from Bahamian waters (Table 1.2). In economic terms the most important of these are the shellfish and finfish fisheries.

Approximately 280 000 km^2 of the Bahamas territory is marine, a significant amount of which is shallow (< 20m). This area, which lies within the Bahamas Exclusive Economic Zone constitutes the largest shallow water area in the Western Atlantic. Four main fisheries exist: the spiny lobster (*Panulirus argus)*, queen conch (*Strombus gigas),* Nassau grouper (*Epinephelus striatus)* and the snapper (*Lutjanus* spp.) fisheries.

Table 1.2. Marine Resources utilised throughout the Bahamas. (Modified from Sealey 1990)

Marine Resources in the Bahamas		
Edible	Finfish	Grouper, Snapper, Hogfish, Jacks, Grunts
	Shellfish	Conch, Whelks, Chiton, Spiny Lobster, Stone Crab, Queen Helmet,
	Sportfish	Marlin, Tuna, Wahoo, Mackerel, Kingfish, Dolphin, Swordfish, Sailfish, Bonefish
	Other	Loggerhead Turtle,
Non-edible	Biological	Turtle Shell, Conch Shell, Coral, Black Coral, Shells, Sponge
	Chemical	Salt, Water from desalination
	Mineral	Aragonite, Building Sand, Petroleum

Other species fished include grunts (*Haemulon spp.*), jacks (*Caranx spp.*), other grouper, loggerhead turtles, shark, stone crabs, the queen helmet shell (*Cassis madagascarienis*) and sponges (*Hippospongia lachne* and *Spongia spp.*). Most of the catch is landed on New Providence, Abaco and Eleuthera and, to a lesser extent on

Grand Bahama, Long Island and Andros. Figure 1.4 shows a trend of increase in the total recorded fisheries landings for the Bahamas between 1980 and 2003.

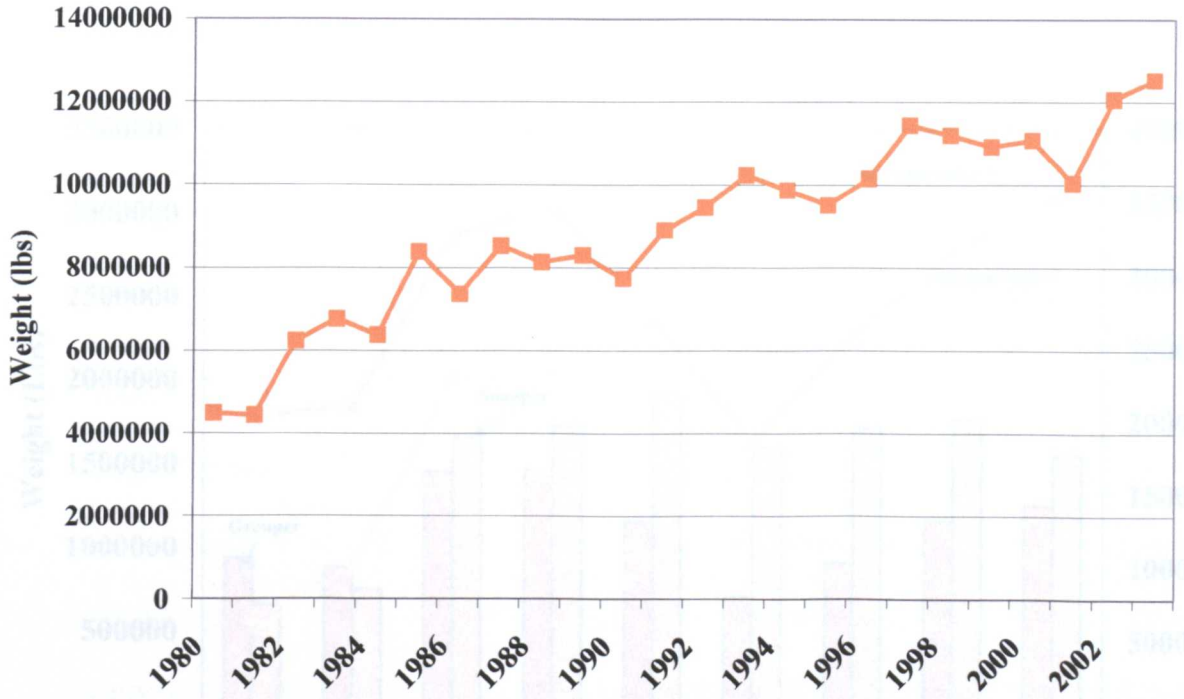

Figure 1.3: Total recorded fisheries landings in the Commonwealth of the Bahamas by weight (lbs) from the years 1980 – 2003 (Data from Bahamas Department of Fisheries 2004 b).

Exploited stocks vary significantly in value with spiny lobster (crawfish) being of the greatest value to the Bahamian economy, followed by conch, grouper (all species) and snapper (Table 1.3). Even though the unit value of grouper is greater than that of snappers, the catch of snapper has increased and surpassed that of grouper since 1997 (Figure 1.4) and the value of each fishery has equalled out somewhat although there were reduced landings of grouper in 2000. This fluctuation and a more recent increase in landings has led to concerns about the status of stocks and sustainability of the

grouper fishery. In January 2004 a one month ban was introduced prohibiting the capture of Nassau grouper, which was extended and repeated from December 2004 – February 2005 over the spawning season. Other finfish species such as grunts and jacks have become more significant in recent years.

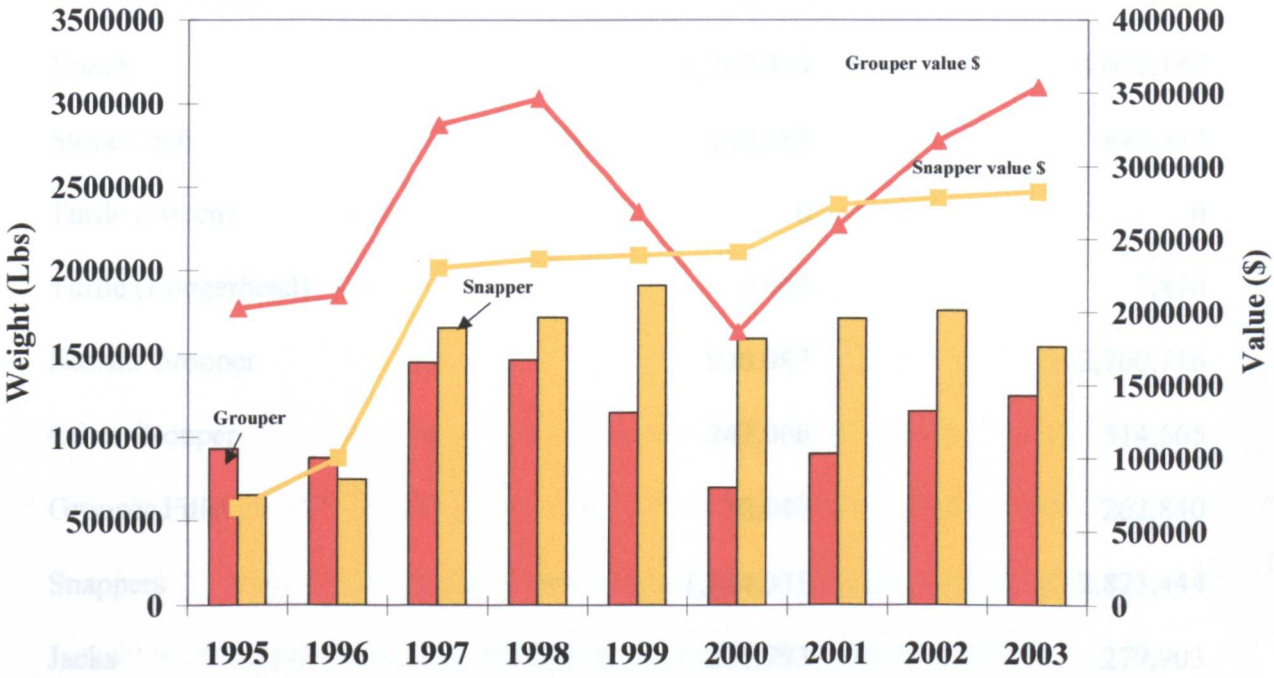

Figure 1.4: Grouper (all species plus fillets) and snapper (all species) catch (lbs) and value (US $) for the Bahamas between the years 1995 and 2003 (Data from Bahamas Department of Fisheries 2004 b).

Table 1.3: Summary of total recorded landings of marine products in the Bahamas during 2003 (Bahamas Department of Fisheries 2004 b).

	Weight (lbs)	Value US $
Crawfish Tails	7,625,120	80,591,058
Crawfish Whole	2,774	9,659
Conch	1,365,844	4,071,187
Stone Crab	108,488	846,377
Turtle (Green)	0	0
Turtle (Loggerhead)	3,065	7,870
Nassau Grouper	930,087	2,760,716
Other Grouper	242,066	514,665
Grouper Fillet	78,047	262,840
Snappers	1,544,031	2,823,444
Jacks	201,793	279,903
Grunts	159,263	164,257
Sharks	620	930
Others	263,096	401,505
TOTAL	12,524,483	92,734,430

1.6.3 Exploitation of finfish

Shallow water finfish are caught using spears, either while free-diving or using compressed air. Traps, hook and line and nets are also utilised. Although the major

finfish fishery is for Nassau grouper, snapper, grunts, and other grouper, hogfish and jacks are also targeted.

1.6.4 The economics of fishing in the Bahamas

The labour force employed in the fisheries sector was estimated at around 9,300 persons following a fisheries census in 1995. Approximately 95% of this number (8835) were fishermen with the remainder being employed in processing or buying stations (Bahamas Department of Fisheries 1998). This accounted for 7.2% of the total labour force in the Bahamas.

In 1998, there were approximately 4,080 commercial fishing vessels, 646 of which were between 20 and 100ft in length, with the remaining vessels ranging between 10 and 19.5 ft. Many of the smaller vessels listed within the total number of fishing vessels work as smaller fishing tenders or platforms in conjunction with the larger vessels.

Fishery catch statistics are collected by the Bahamas Department of Fisheries. Only recently has catch per unit effort (CPUE) data been recorded on a computer database, and previous records were incomplete. Consequently, it is very difficult for fisheries officers to accurately assess the Bahamas main fisheries.

1.7 Critical fish habitats in the Bahamas

1.7.1 Coral reefs

Coral reefs cover an area of just over 1800 square km of the Great Bahama Bank and approximately 324 square km of the Little Bahama Bank (Wells 1988).

These reefs are most prominent on the windward north and eastern sides of the islands and cays, developing best a short distance from shore. The occurrence of coral in the central area of the Bank platforms is limited due to turbidity and strongly variable physical conditions. The best development of coral reef is in association with islands along the margins of the platforms.

Squires (1958) described 25 species of stony corals and their distribution in localities around Bimini. Newell *et al.* 1959 described the occurrence of 30 species of hermatypic corals of which only a few contribute significantly to reef building. In the Exuma Cays, (Sluka *et al.* 1996) described 53 species of algae, 49 sponges, 36 scleractinian corals, 29 octocorals, 3 black corals, 4 anemones, 2 zooanthids and 2 coralliomorphs. Bohlke and Chaplin (1968) described marine fish species, their abundance and distribution throughout the Bahamas.

1.7.2 Seagrass

Seagrasses can be found on the Great and Little Bahama Banks, the Cay Sal Bank and in tidal estuaries, lagoons and sheltered bays of Islands and Cays across the archipelago. Three seagrass species exist, and are commonly encountered, these are *Thalassia testudinum, Syringodium filiforme* and *Halodule wrightii.* In a study carried out on San Salvador Island, Smith *et al.* (1990) concluded that low energy sites had a higher frequency of *Thalassia* with a lesser amount of *Syringodium* and *Halodule.* Whereas, high energy sites appeared to favour *Syringodium.* Seasonal variations in biomass also occurred with increases in *Syringodium* and *Halodule* and a decrease in *Thallasia* during the months of July to December.

Seagrass meadows provide important habitat for juvenile reef fish and invertebrates, they contribute organic material to down-stream habitats, stabilise sediments and act as a food source to herbivorous fishes and sea turtles.

1.7.3 Mangrove

Rhizophora mangle trees are found on the coastal fringe of sheltered bays and lagoons in tropical and sub-tropical areas (Figure 1.5). They are generally, the most seaward of the main Caribbean mangrove species, and have the greatest rates of dispersal (Odum and McIvor 1990), developing large stands or forests. Their extensive prop root system assists in supporting the tree, increases sediment accumulation, and permits gaseous exchange in a low oxygen environment.

Figure 1.5: A typical mangrove channel in a Bahamian tidal lagoon with a red mangrove fringe. Note prop roots, and rich seagrass growth.

The root system is rich with nutrients from detrital matter that falls from the trees (in Florida, USA, this may be as much as 3 tons per acre per year in a healthy stand, Odum and Heald 1972). This habitat supports a richness of organisms that feed on detrital matter, providing a food supply for juvenile fish (Heald and Odum 1970).

Mangrove species in the Bahamas form a typical zonation pattern. *Rhizophora mangle* dominates the waters edge, but then becomes interspersed with black mangrove (*Avicennia germinans*) landward. At higher levels there is commonly an area dominated by white mangrove (*Laguncularia racemosa*), Buttonwood (*Conocarpus erectus*) and other coastal vegetation such as Sea Grape (*Coccoloba uvifera*) and Palmetto palm (*Sabal palmetto*).

The Bahamas has the second highest mangrove coverage for an Island State in the Caribbean after Cuba, and in comparison to Continental Caribbean States ranks fifth overall after Mexico, Colombia, Venezuela and Cuba (Spalding *et al.* 1997).

1.8 San Salvador island

Commonly recognised as Christopher Columbus' first landfall in the "New World", San Salvador island is located on an isolated carbonate platform to the north east of the Bahamas archipelago (Figure 1.2). The island, which is approximately 20 km x 10 km is composed of a series of dune ridges with saline lakes lying in between, which together cover approximately a third of the island (Gerace *et al.* 1998) (Figure 1.6). These lakes are hypersaline and may reach salt concentration in excess of 165 $^{o}/_{oo}$ (Paerl *et al.* 2003). San Salvador has a human population of around 800, and employment on the island is provided by the government sector, tourism related business, a scientific research and education field station, construction work and fishing. Fishing is generally for local consumption, and for supply to the tourist resorts and restaurants on the island. San Salvador is surrounded by a series of fringing reefs, and by only one area of oceanic shoreline mangrove fringe. The main concentration of *Rhizophora mangle*, fringes the tidal lagoon of Pigeon Creek in the south east of the island. Seagrass beds are particularly extensive in more sheltered areas such as French Bay, Graham's Harbour and Pigeon Creek.

Figure 1.6: San Salvador Island, Commonwealth of the Bahamas

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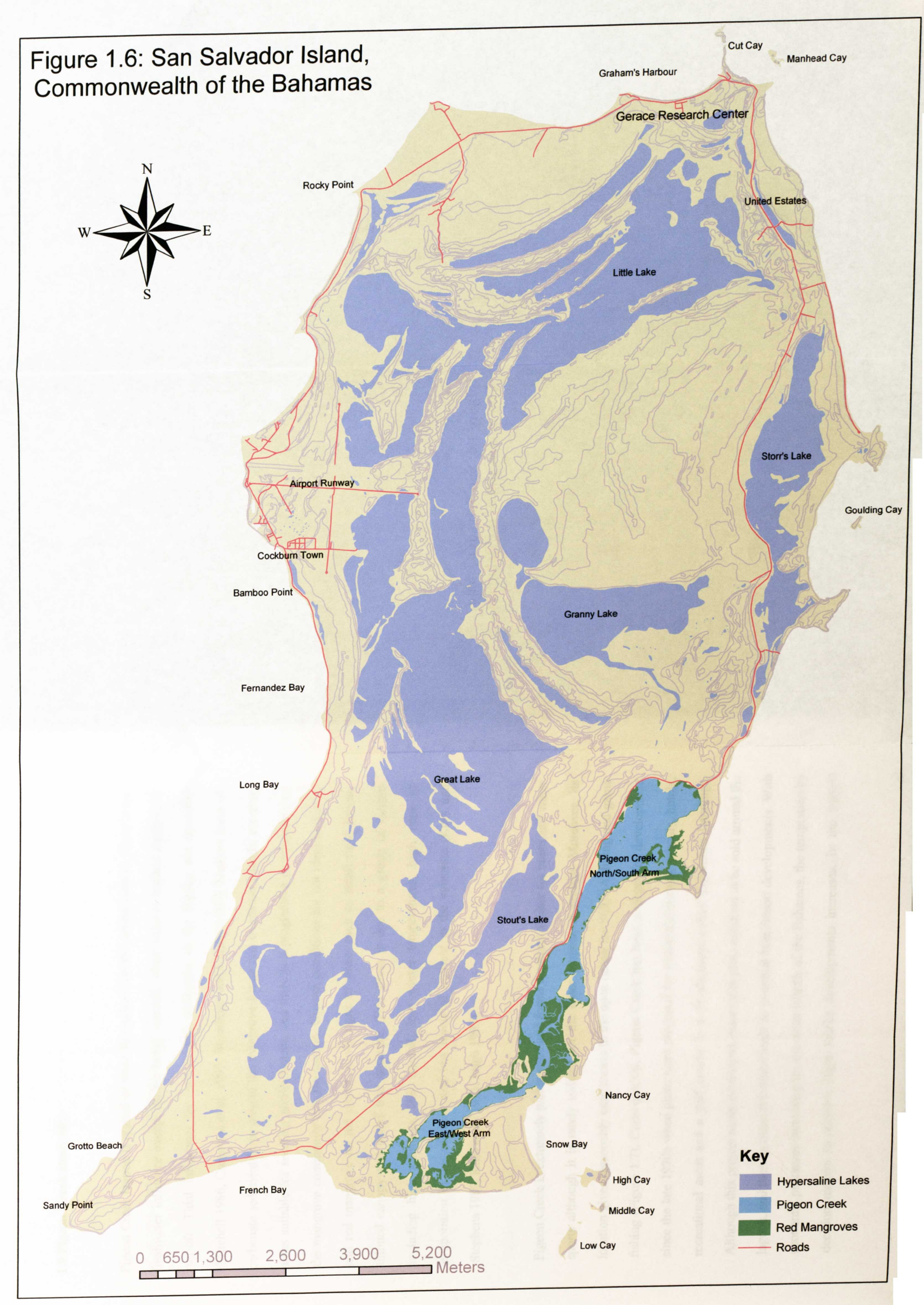

1.9 Pigeon Creek study site

Pigeon Creek lagoon is typical of many throughout the Bahamian islands. There is no freshwater influence except during heavy rainfall, when there is limited freshwater run-off. Tidal influences are strong, and sediments in the lagoon are dynamic (Mitchell 1986, Cummins *et al.* 1995, Boardman and Carney 1996). Shallow areas of carbonate sediment form around the mangrove fringe and overwash islands, creating areas suitable for seedling establishment, and there is a progressive development of the mangrove community into the lagoon. Growth conditions are not ideal however, and red mangrove on the island shows signs of stress such as small rigid leaves, thinned canopy and dwarf tree structure. This stress is due to a group of factors including high salinities, low rainfall, low winter temperatures, high rates of evaporation in the summer, and low levels of nutrient in the substrate (Kass and Stephens 1989, Kass *et al.* 1993, Lugo 1993).

Pigeon Creek is extremely picturesque and forms a natural shelter for boats and water sports although it is rarely utilised for the latter purpose at present. Moreover, its location gives reasonably easy access to the open ocean for SCUBA diving and game fishing (Figure 1.7). Consequently, Pigeon Creek has been a target for development since the late 1970s when plans were proposed for residential homes, schools, hotels, recreational areas and a golf course in a development called Columbus Landings. Although this project never developed, residential plots continue to be sold around the lagoon, and there is often reference made to potential hotel/resort developments. With economic pressures increasing for the outer islands of the Bahamas, the temptation by decision makers to approve large tourist developments increases. In the current

economic climate it is quite possible that Pigeon Creek will be targeted for development.

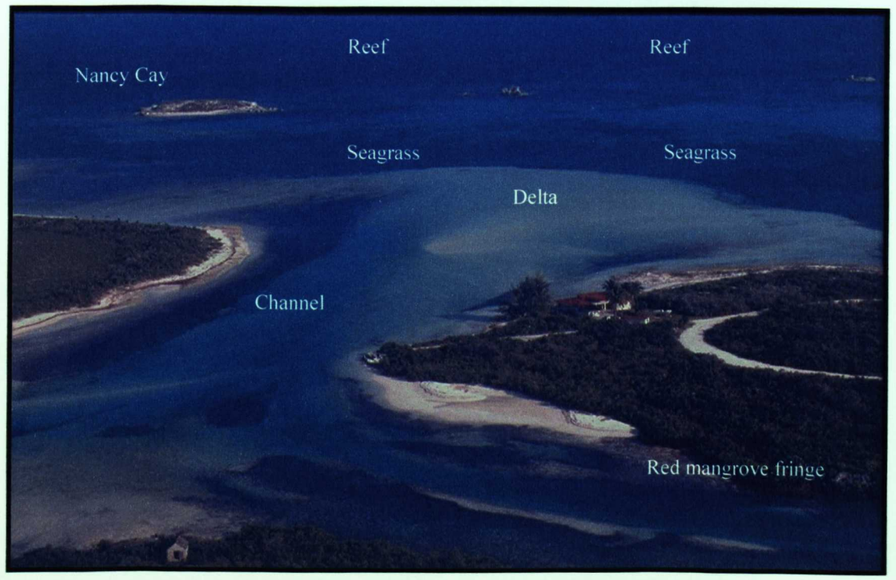

Figure 1.7 Aerial view of Pigeon Creek lagoon channel and delta with seagrass meadow beyond, and small cays and fringing reef further offshore.

1.10 Aim and outline of study

The principal aim of the present study was to determine what influences juvenile fish distribution in *Rhizophora mangle* prop root habitat in the tidal lagoons of the Bahamas, using Pigeon Creek as a test site.

The present study investigates biotopic, hydrophysical, structural and biological influences on juvenile reef fish distribution from both the natural mangrove habitat,

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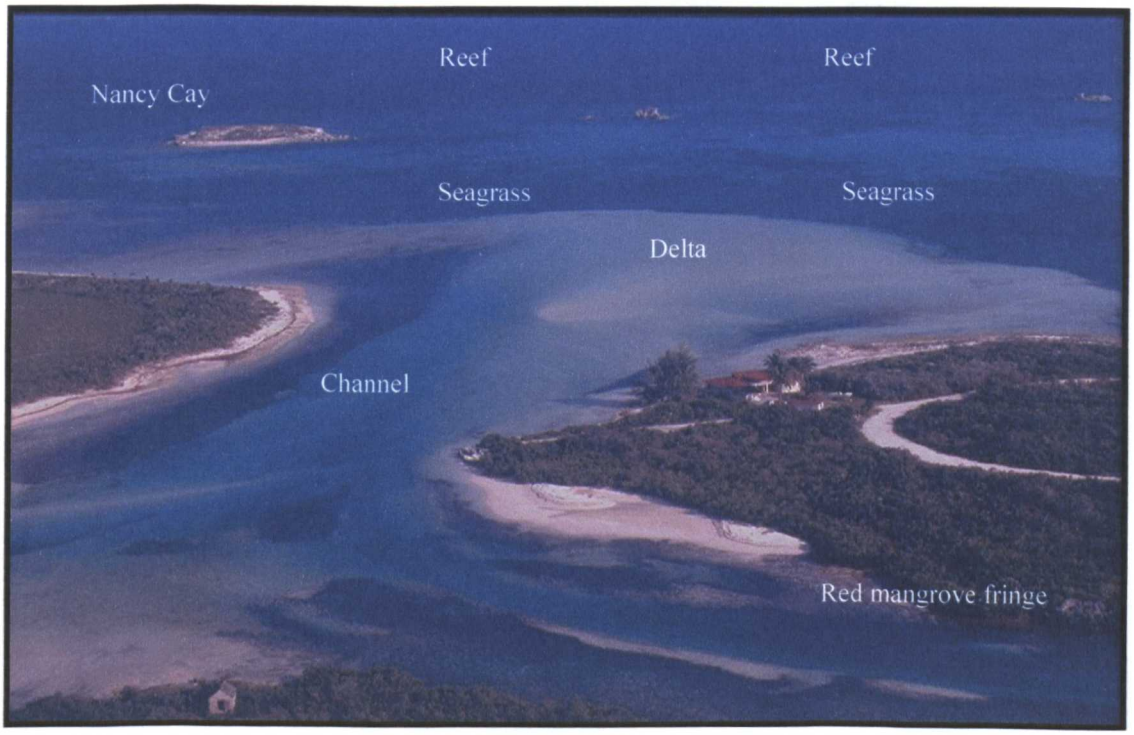

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and through the experimental manipulation of artificial structures, and examines this system through all seasons over a two year period.

Chapter 2 presents a detailed description of marine and intertidal habitats utilised by juvenile fish in Pigeon Creek lagoon. It shows the spatial distribution of different biotopes and the areal development of mangrove habitat over the last 57 years. The physical environment of Pigeon Creek is described in Chapter 3, detailing water temperatures, salinities, pH, dissolved oxygen, tidal fluctuations, and flow rates. Chapter 4 describes the abundance, community structure and distribution of juvenile fish at different spatial scales in the study area. It investigates seasonality in the most common fish families, and potential physical influences on juvenile fish distribution such as, salinity, dissolved oxygen, flow rates, distance from the lagoon opening and lunar phase. Chapter 5 describes juvenile fish distribution specifically within the mangrove prop root habitat, and concentrates on the influence of canopy shade, root density and the biomass of epiphytic algae growing on the prop roots. This is followed by a description of controlled experimental manipulations of artificial mangrove habitat described in Chapter 6. This experimental work was done in order to identify the physical and behavioural influences which determine habitat preferences within the mangrove prop roots system. Artificial mangrove structures were manipulated in the field with various canopy shade and root density treatments at various distances from the natural mangrove fringe specifically to determine the influence of shade, habitat complexity and vulnerability to predation.

Chapter 2

Mapping Habitats, and the spread of *Rhizophora mangle* in Pigeon Creek Lagoon

2.1 Introduction

There has been increased interest and effort by many coastal and island states to map coastal land and subtidal features in recent years (Blair-Myers *et. al* 1993, Blair-Myers *et al.* 1995, Sheppard *et al.* 1995). The continued development of remote sensing technologies, the relative ease of image acquisition and increased use of Geographic Information System interfaces have simplified the task of assessing coastal habitats.

Mapping coastal habitats provides a baseline of information on the distribution and extent of particular habitats of potential, biological, economic and social importance. Coastal geomorphological processes, and anthropogenic and natural changes can be evaluated over time, making coastal development decisions more informed and comprehensive. Many image sources are available that can be utilised in mapping tropical and subtropical coastal areas. These vary in spatial and spectral resolution, and may come, from satellite or airborne sensors. Image sources, interpretative methods and technologies are reviewed extensively in Green *et al.* (2000).

The type of images required to produce habitat maps will depend on the objectives of the mapping exercise, the size of area being mapped, the desired resolution, and accuracy, as well as more practical issues including funds available for image acquisition, time constraints and the expertise of those involved in the mapping project. Satellite imagery is generally used for more coarse habitat mapping over extensive areas, while aerial photographs are preferred for fine resolution mapping.

Habitat mapping as a means of assessing fisheries resources has progressed very slowly (Green *et al.* 2000). For this purpose, the mapping of coral reefs, seagrass beds and mangrove areas, has been a surrogate, using the assumption that these habitats are important for, and indicative of the extent of finfish and/or shellfish. This inference is potentially unfounded however, as many other factors may affect the distribution of fisheries resources within a given habitat. Indeed, Stoner *et al.* (1996) identified areas on the Grand Bahama Bank from satellite images that were preferable nursery habitat for the queen conch (*Strombus gigas*) only to find during ground verification that only 10% of the identified optimal nursery habitat was being utilised.

In the Bahamas, efforts have been made to map land and coastal habitats. The Bahamian Archipelago Landcover Mapping Project was established in 2001 to identify the distribution of critical habitats, including wetlands, using Landsat 7 images. As part of the Nature Conservancy sponsored Bahamas Ecoregional Plan the information is to be used in an atlas of maps and spatial datasets, identifying the current status of communities or populations.

San Salvador Island in the Bahamas (Figure 1.6) has been a centre for studies in Archaeology, Biology, Carbonate Geology and Marine Science since the early 1970s at the Gerace Research Center (formerly the Bahamian Field Station). In an effort to consolidate 30 years of scientific field information the San Salvador Island Geographic Information System Database (Robinson & Davis 1999) incorporated many of the cultural, geological and biological resources of the island in digital map form. Information layers in the database were used by Robinson (2001) to assess potential areas for island development with consideration of environmentally sensitive

areas, topography and the availability of fresh water resources. One site identified as environmentally sensitive, and under potential development threat was Pigeon Creek lagoon.

The focus of this study was to present an overview of this typical tidal lagoon, focussing on the habitat preferences of juvenile fish within the *Rhizophora mangle*, its associated complex and dynamic habitats. Aerial photographs were used to map the area, so the resulting maps present a high resolution view of the lagoon. Little is known about how quickly mangroves develop in these systems where trees are subjected to extreme environmental stresses Lugo (1993), so the aerial photographs spanning a 57 year period were digitised to examine mangrove stand development.

2.2 Methods

2.2.1 Aerial photograph acquisition and registration

In June of 1999 a series of colour aerial photographs (scale 1:10,000) of Pigeon Creek were taken (Figure 2.1). These images were imported into ArcView (ESRI 1996) and geo-referenced to the Universal Transverse Mercator (UTM) projection system (zone 18), using the North American Datum (NAD) 1927. Minor parallax errors were geometrically corrected in ArcView using global positioning system ground control points. Black and white photographs from 1942 and 1968 with scales of 1: 30,000 and 1: 25,000 respectively were also acquired from the Bahamian Field Station archives, and were geo-referenced in the same manner. The June 1999 fly-over omitted a section of Pigeon Creek in the far west of the east/west arm, and consequently a

1:25,000 scale 1968 image of this area was used to give complete coverage of the lagoon.

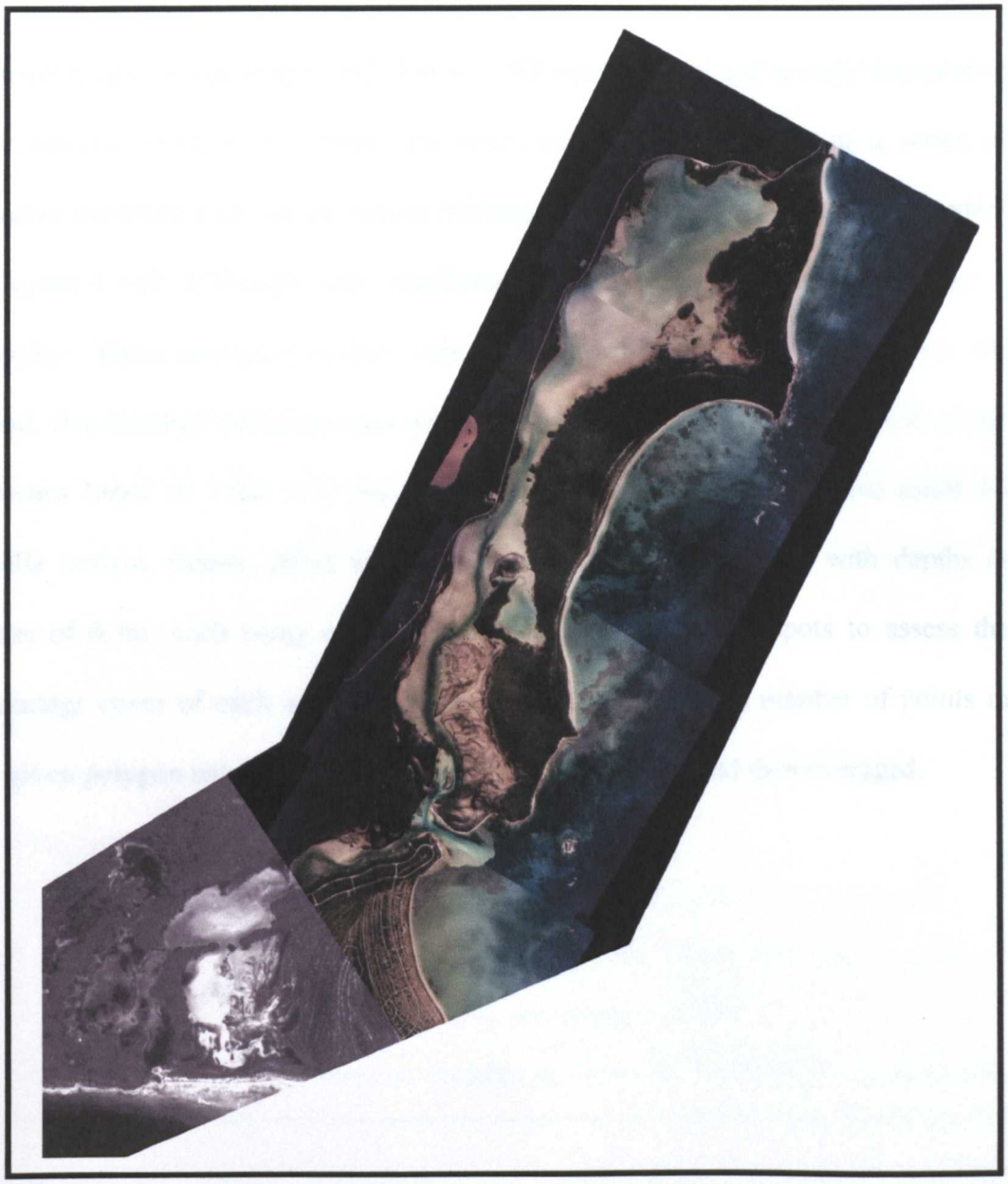

Figure 2.1: Mosaic of aerial photographs of Pigeon Creek lagoon, taken in 1999 (colour) and 1968 (black and white).

2.2.2 Habitat identification and ground verification

Four 1999 colour aerial photographic images and one 1968 black and white image were laminated for use in the field. Areas of different spectral and textural appearance were marked using a permanent fine point marker pen, resulting in a series of polygons outlining a mosaic of various habitats and water depths across the full extent of Pigeon Creek. Polygons were numbered on the acetate for ground verification purposes. These annotated images were taken into the field, where over a two day period, five hundred polygons were visually classified using percentage cover of the attributes listed in Table 2.1. An underwater viewer (Nouva Rade Spa made by Casella Scrivia, Genoa, Italy) was used in most subtidal polygons with depths in excess of 0.3m, each being examined at a number of random spots to assess the percentage cover of each attribute. Depth was recorded from a number of points in any given polygon using a rod marked in 10 cm increments, and then averaged.

Table 2.1: List of attributes that could contribute to a particular habitat. In the context of this study, habitats or biotopes are unique and easily discernable environments. These habitats may be comprised of a number of attributes, for example seagrass habitat may be classified as such because it is dominated by seagrass, but may have other attributes in lesser amounts such as macroalgae, or sand and mud. For example, a polygon with the following composition (50% seagrass, 20% macroalgae, 30% sand/mud) would be classified as seagrass.

Habitat Attribute	Composition
Bare Sand/Mud	Fine grain carbonate mud or coarser sand with mixed shell content.
Rock	Carbonate bedrock or karst
Coral	*Siderastrea radians, Diploria sp.,* *Porites sp.*
Sponge	*Ircinia sp., Tedania ignis*
Red Mangrove	*Rhizophora mangle*
Black Mangrove	*Avicennia germinans*
Coastal Vegetation	Including: *Conocarpus erectus, Sabal palmetto, Coccoloba uvifera*
Seagrass	*Thalasia testudinum,* on occasion mixed with small amounts of *Syringodium filiforme and Halodule wrightii*
Macroalgae	*Halimeda* sp., *Penicillus* sp. *Udotea* sp., *Batophora* sp. *Acetabularia* sp.

Following field verification, a further 80 polygons were identified and classified. Polygon boundaries were digitised at a scale of 1: 1500 – 1:2000 using ArcView's digitising facilities with an optical mouse (which was more responsive and accurate than a ball mouse). Ground verified data was incorporated into the GIS, and areas calculated for each polygon. The percentage cover of each attribute type within each polygon was then converted into the actual area it covered.

2.2.3 Analysis of lagoon biotope data

Cluster analysis was performed on the attribute data for each polygon in order to identify any patterns of habitat/attribute distribution within the lagoon. Polygon data (Appendix I) were pooled to make interpretation of the cluster dendrogram possible. Polygons were numbered in sequence from the northern-most reaches to the westerly extent of the east/west arm of the lagoon. The data for each of these polygons were then pooled in groups of three where polygons 1, 2 & 3 would become 'pooled polygon number 1' and so on, until there were 580/3 = 193 sets of polygon data (one set consisted of 4 pooled polygons). The attributes in each set were added together and analysed using PRIMER (Plymouth Routines in Multivariate Ecological Research) software. Clusters were created using the Bray-Curtis similarity coefficient, and data were not transformed.

2.2.4 Bathymetric mapping

During ground verification, average water depth in each polygon was also measured and recorded in an ArcView cover. Maps showing bathymetric detail were geo-processed to merge polygons with similar depths, however since depth measurements were recorded throughout the day at various parts of the tidal cycle, the resulting bathymetric map only depicts relative depths, but shows clearly tidal channels, shallow sand flats and anomalous deep areas.

2.2.5 Areal spread of red mangrove

Aerial photographs of Pigeon Creek from 1942, 1968 and 1999 were analyzed. The quality of the 1942 black and white photographs, especially in areas dominated by highly reflective calcium carbonate sand and mud was rather poor and over exposed, but both the 1968 and 1999 photographs were of good quality. In order to compare areal spread of red mangrove over the 57 year period, polygons containing 100% red mangrove density for each of the photographed years were selected. The area of the selected polygons from the 1942 and 1968 photographs were compared to those from the most recent 1999 images. In total 23 suitable mangrove polygons were identified and digitised.

2.3 Results

2.3.1 Habitat identification and ground truthing

From the northern most point of the north/south arm of Pigeon Creek, to the western most point on the east/west arm, the lagoon is 9.2 km long, it is 1.7 km at its widest point and 52 m at its narrowest. Assessment of the Pigeon Creek maps constructed from digitised 1968 and 1999 photographic images, presents a complex array of intertidal and shallow subtidal lagoon biotopes (Figure 2.2).

Figure 2.2: Pigeon Creek lagoon biotope map

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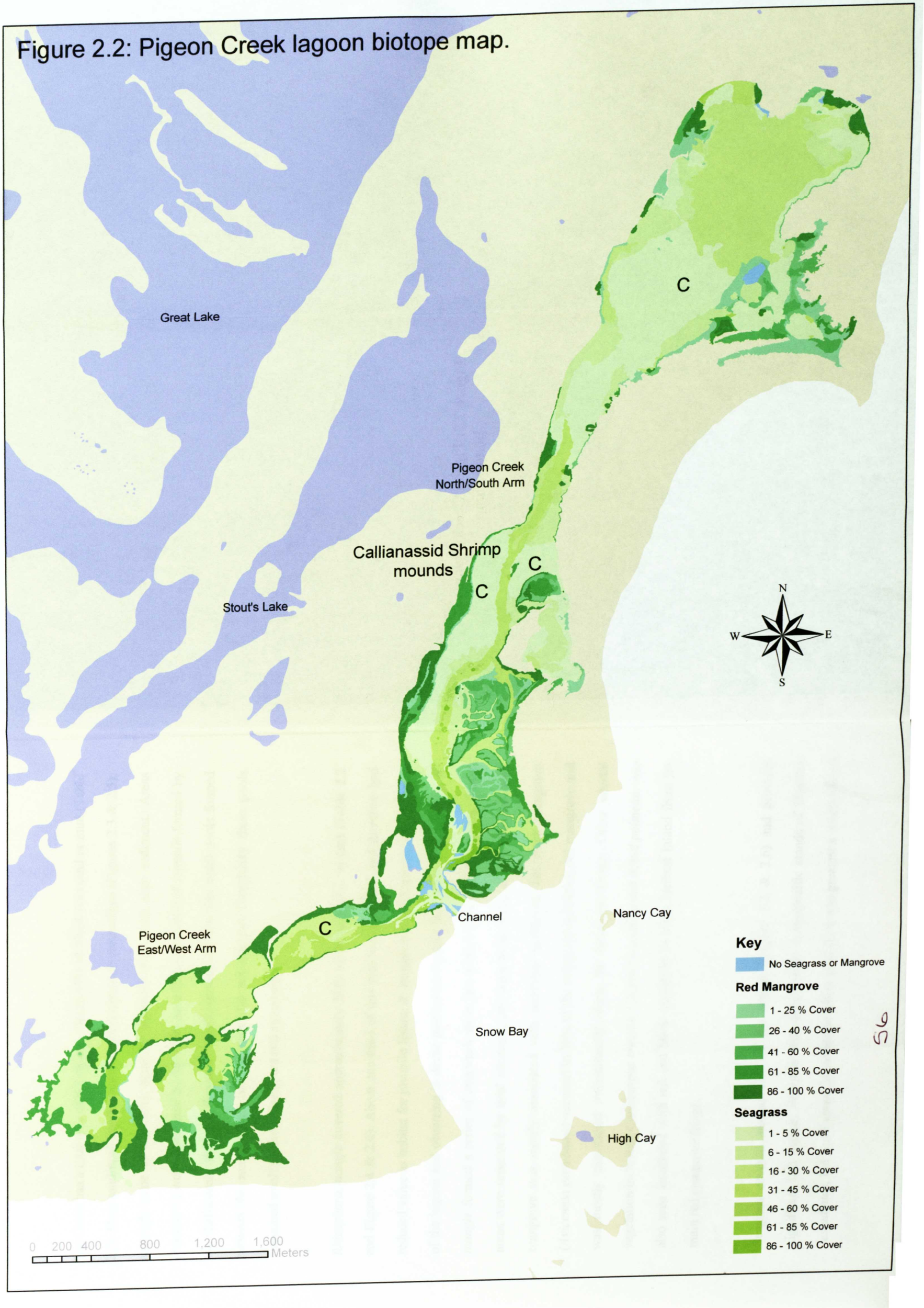

The Creek has a total area of 6.2 sq km, almost 60% of which was sand or mud (Table 2.2). Most sand/mud was associated with seagrass or macroalgae (Figures 2.3 & 2.5), although some of the more dynamic intertidal areas were bare sediment. Areas (marked C) were dominated by intertidal sand flats composed of mounds formed by the Callianassid shrimp (*Glypturus acanthochirus*). At low tide small pools formed between the mounds and because they did not dry out completely these pools contained small patches of seagrass and macroalgae.

Rhizophora mangle covered approximately 21% of the area (1.2 sq km) (Table 2.2 and Figure 2.4 & 2.6). About one third of this area was intertidal, and therefore had reduced value as habitat for juvenile fishes. *R. mangle* was widespread, fringing most of the lagoon and occurring in dense patches throughout the whole area. Notably, *R. mangle* formed a series of overwash areas just north of the lagoon opening. These areas were separated by tidal channels, and were most dense at their margins. Red mangrove was mostly associated with sand/mud attributes, but black mangrove (*Avicennia germinans*) occurred in 16% of the polygons containing red mangrove and was mostly distributed intermittently along the landward fringe. Other coastal vegetation including *Conocarpus erectus*, *Coccoloba uvifera* and *Sabal palmetto,* was also seen associated with red and black mangrove in areas farthest inland from the main red mangrove fringe.

Seagrass covered around 13% of the lagoon, (Figure 2.3 & 2.6) and provided significant fish habitat. Seagrass beds were mostly monospecific stands of *Thalasia testudinum,* but some areas, in particular where tidal flow was greatest a small amount

of *Syringodium filiforme* and *Halodule wrightii* could be found. *T. testudinum* beds were evident throughout, but were most dense in the mid and upper reaches of the east/west arm, in deeper channels and in areas of moderate tidal flow. Notably, dense patches would occur at the openings of tidal channels where they emptied into the main water body of the lagoon, and also in seemingly random dense patches in deeper channel areas, particularly in the lower north/south arm. *T. testudinum* beds at the lagoon opening were extremely dense, but were scoured by the strong tidal flow. On steep sides of the channel into the east/west arm, the rhizome root systems of the seagrass were exposed, illustrating the strong tidal current. Transportation of carbonate sediments out of the lagoon has formed a delta where the lagoon channel opens out into Snow Bay (Figure 1.7).

For seagrass, 100% densities within polygons was rare. *Thalasia testudinum* was normally associated with macroalgae, in particular calcareous species of the genera; *Avrainvillea, Halimeda, Penicillus, Udotea,* and *Acetabularia,* but also more fleshy types such as *Batophora.*

Table 2.2: The area (hectares) of different subtidal and intertidal habitat attributes in Pigeon Creek lagoon.

Biotope	Area (hectares)	% Cover
Seagrass	79.25	12.7
Macroalgae	38.63	6.2
Sand/Mud	361.1	57.7
Rock	6.9	1.1
Coral	0.004	0.0
Sponge	0.064	0.0
Red mangrove	130.6	20.6
Black mangrove	6.2	1.0
Coastal Thicket	3.2	0.5
Total Area	**626.1**	**100.0**

Figure 2.3: Pigeon Creek Lagoon Seagrass Coverage

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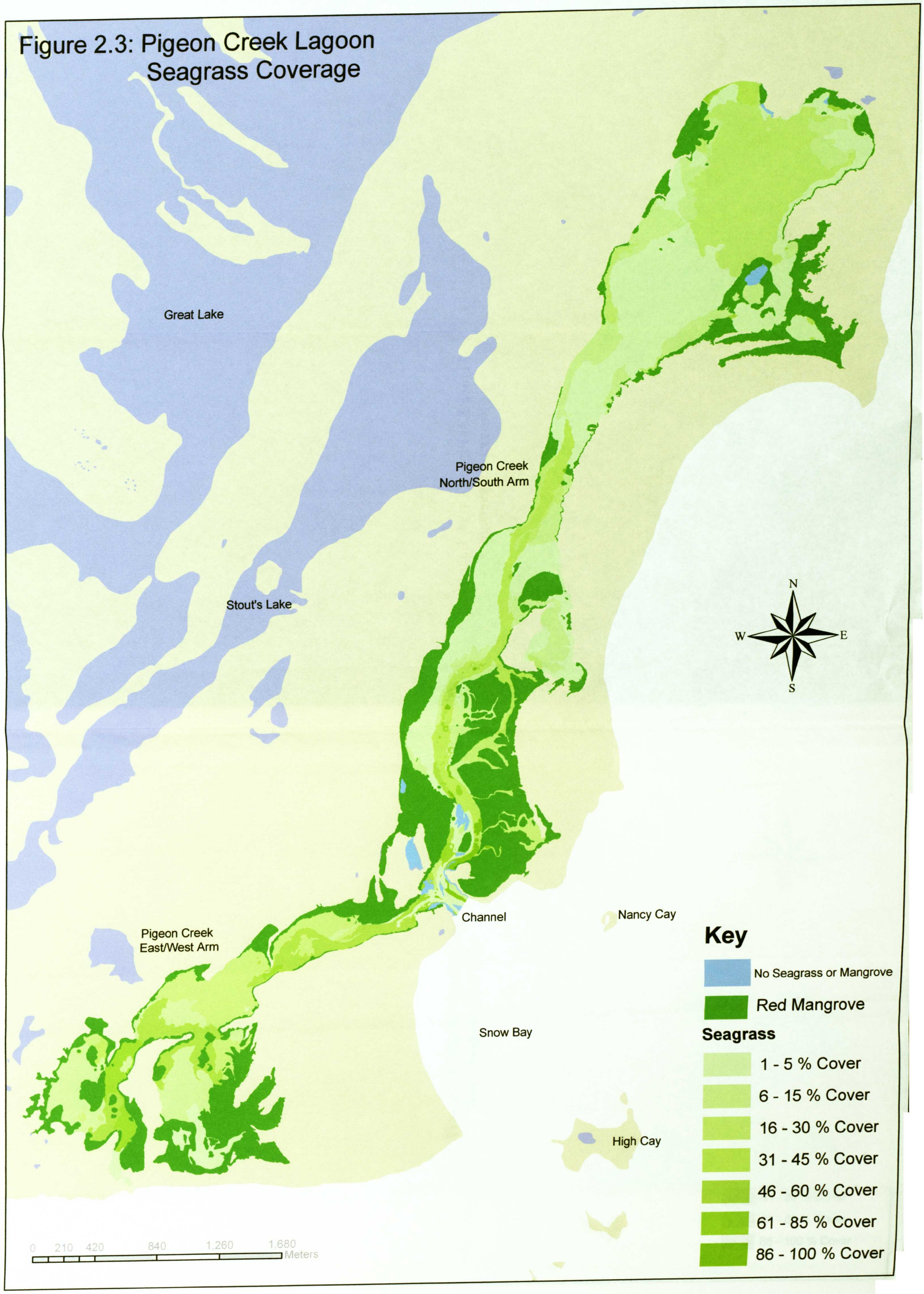


Figure 2.4: Pigeon Creek Lagoon,
Red Mangrove Coverage

Figure 2.4: Pigeon Creek Lagoon Red Mangrove Coverage

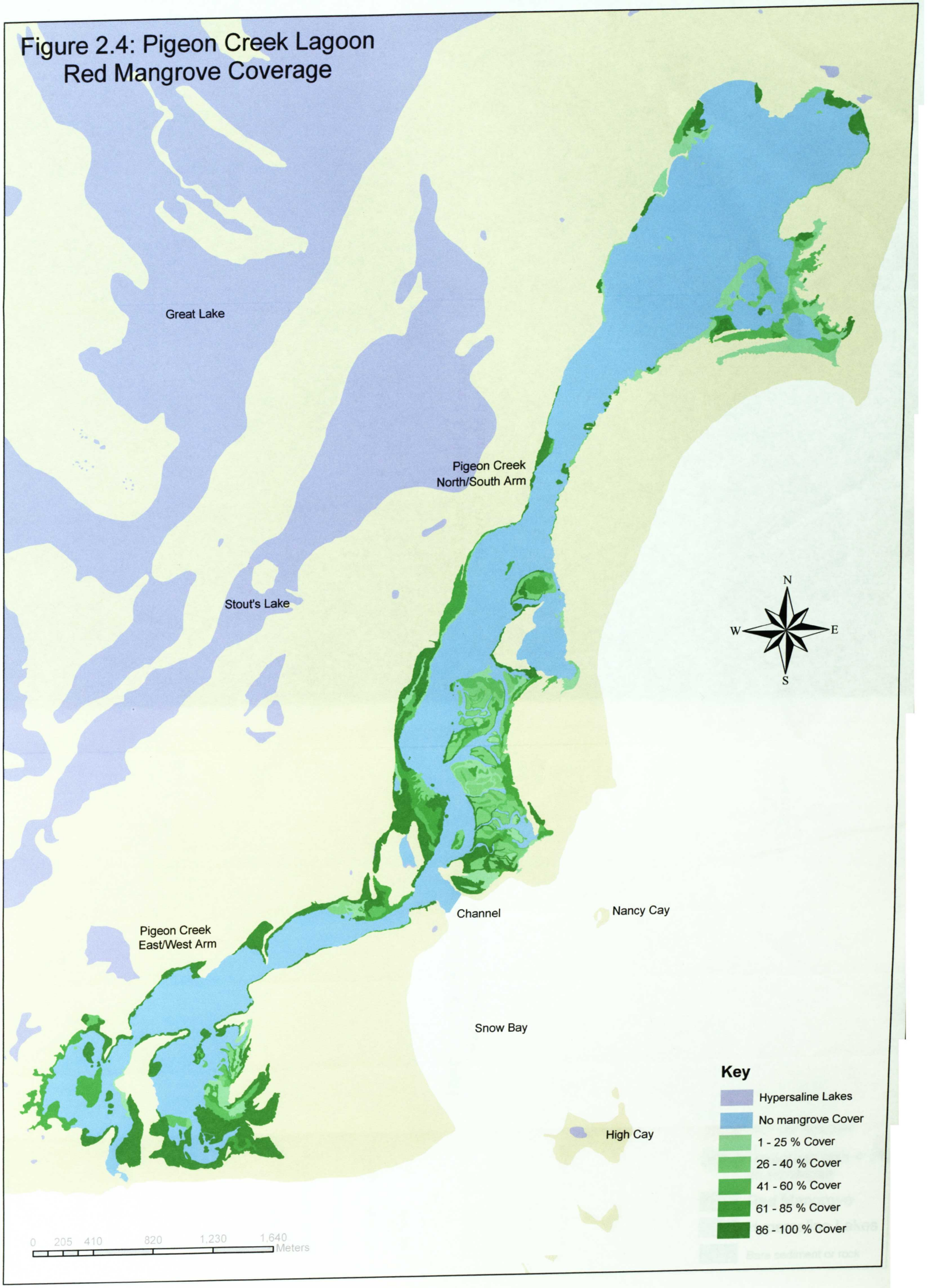
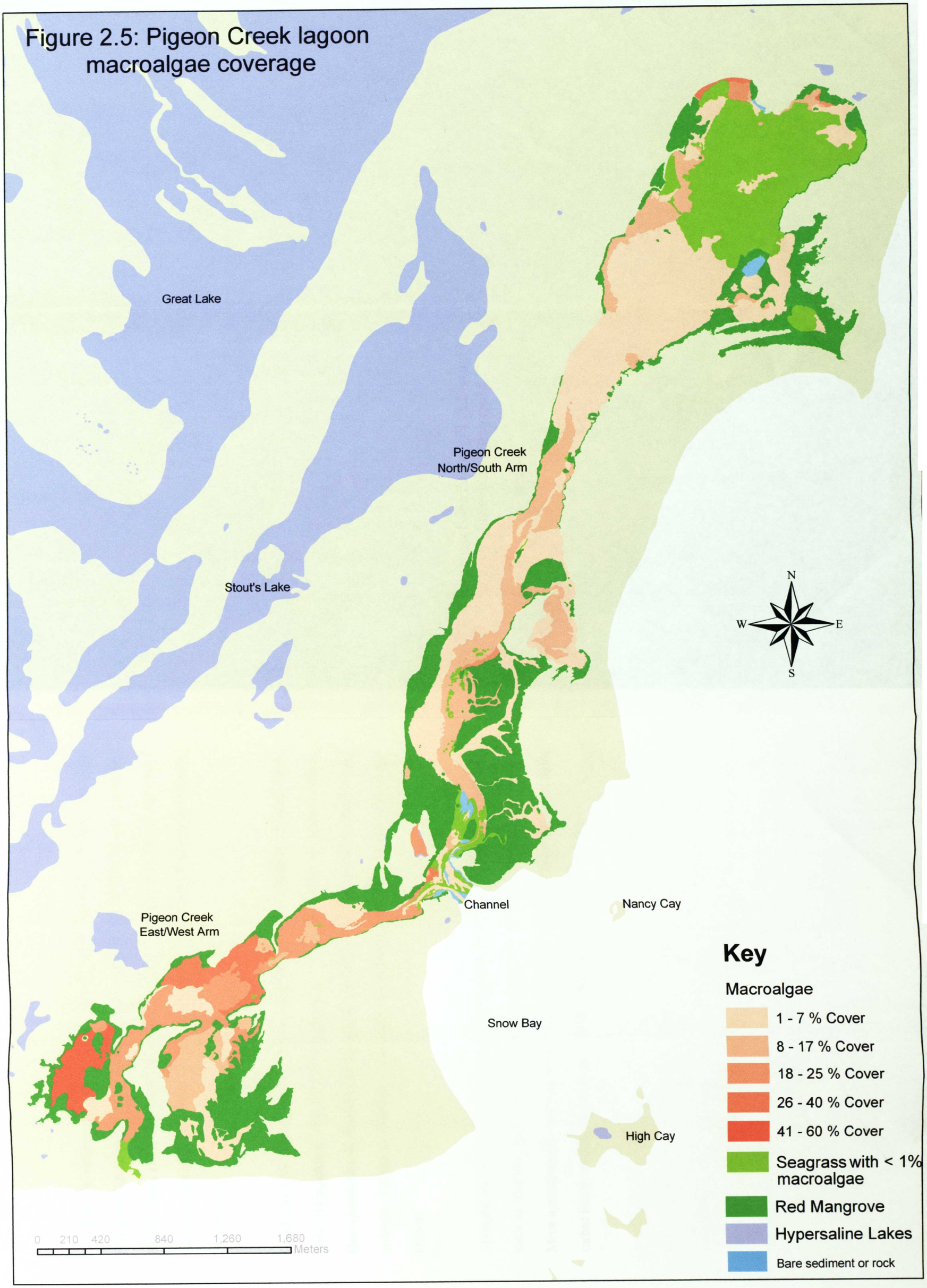


Figure 2.5: Pigeon Creek Lagoon Macroalgae Coverage

Figure 2.5: Pigeon Creek lagoon macroalgae coverage



Occasionally patches of red coralline algae and loose pieces of *Dictyota sp.* were found tangled amongst the seagrass blades. Macroalgae accounted for approximately 6% coverage (38.6 hectares) and was found in the greatest densities in the upper reaches of the east/west arm, and associated with seagrass in the deeper tidal channels (Figure 2.5).

Coral was very rare in the lagoon occurring mostly at the entrance channel where water transparency, salinity and temperatures were most similar to oceanic values. One species found throughout the lagoon was the hardy *Siderastrea radians.* Small colonies, <20cm in diameter were found in shallow rocky areas, at the edge of the lagoon.

Sponges also had minimal coverage. Encrusting species, and low profile tube forms such as *Tedania ignis* were found amongst the seagrass in moderate current areas. More upright species such as *Ircinia strobilina* were found in low current deeper more turbid locations in the upper reaches of the north/south and east/west arms.

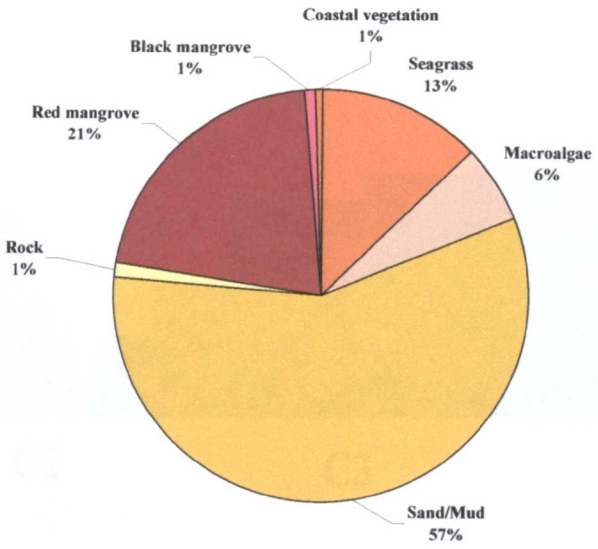


Figure 2.6: The percentage cover of different habitat attributes in Pigeon Creek lagoon.

2.3.2 Lagoon habitat attribute analysis

Figure 2.7 illustrates the distribution of habitat attributes throughout the lagoon. Cluster 1 (n = 15 pooled, equivalent to 45 unpooled polygons) consists of polygons with high percentage cover of red mangrove and are distributed across the whole sample area (Table 2.3). The distribution shown in the boxplot indicates that there is comparatively less mangrove cover in the most northerly parts of the lagoon. Most mangrove rich polygons are distributed from half way up the north/south arm south to the channel area and throughout most of the east/west arm.

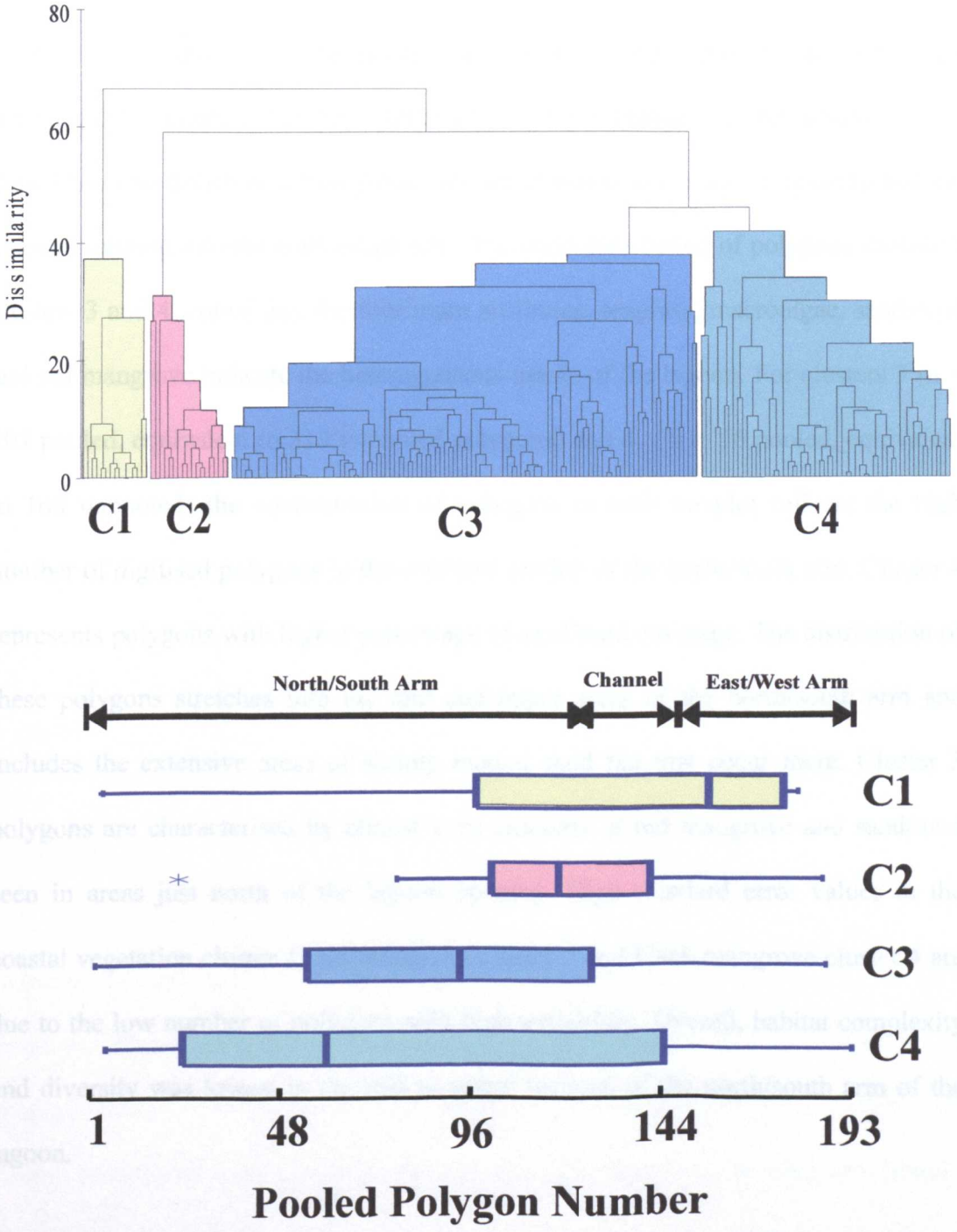


Figure 2.7: Cluster dendrogram of pooled polygon data analysed using the Bray-Curtis coefficient on non-transformed % attribute coverage data, boxplots show the spatial distribution of pooled polygons through out the study site. Polygons (N = 580) were pooled in groups of 3 (and one of 4) and numbered 1 – 193 in a north to south orientation.

Cluster 2 polygons (n = 18 pooled, equivalent to 54 unpooled polygons) are dominated by seagrass but have relatively high percentages of macroalgae (Table 2.3). These are distributed throughout the deep channels at the lagoon opening and the channel running into the north/south arm. The wide distribution of polygons shown in clusters 3 and 4, containing the four main attributes, seagrass, macroalgae, sand/mud and red mangrove indicate the heterogeneous nature of the lagoon. For clusters 3 (n = 104 pooled, equivalent to 313 unpooled polygons) and 4 (n = 56 pooled, equivalent to 168 unpooled) the concentration of polygons in each boxplot reflects the high number of digitised polygons in the southern section of the north/south arm. Cluster 4 represents polygons with higher percentage of sand/mud coverage. The distribution of these polygons stretches into the mid and upper areas of the north/south arm and includes the extensive areas of shrimp mound sand flat that occur there. Cluster 3 polygons are characterised by almost even amounts of red mangrove and sand/mud seen in areas just north of the lagoon opening. High standard error values in the coastal vegetation cluster 1, red mangrove cluster 2 and black mangrove cluster 4 are due to the low number of polygons with high variability. Overall, habitat complexity and diversity was lowest in the mid to upper sections of the north/south arm of the lagoon.

Excluding the channel opening of the lagoon the north/south arm of Pigeon Creek had an area of approximately 4.2 sq Km, about double that of the east/west arm. There were marked differences in habitat composition of each arm. Proportionally, the east/west arm had a 20% cover of seagrass compared to 9% for the north/south arm of the lagoon. Macroalgae cover was over four times greater in the east/west arm compared to that of the north/south (13 % and 3% respectively). Sand/mud cover was

68% in the north/south arm, and red mangrove cover 17%, compared with a sand/mud cover of 37% in the east/west arm and red mangrove cover of 29%. These results show that a major portion of the north/south arm of the lagoon is less complex and more homogeneous in habitat composition.

Table 2.3: Averaged pooled polygon percentage cover, of habitat attributes represented in clusters 1 – 4. (±SE)

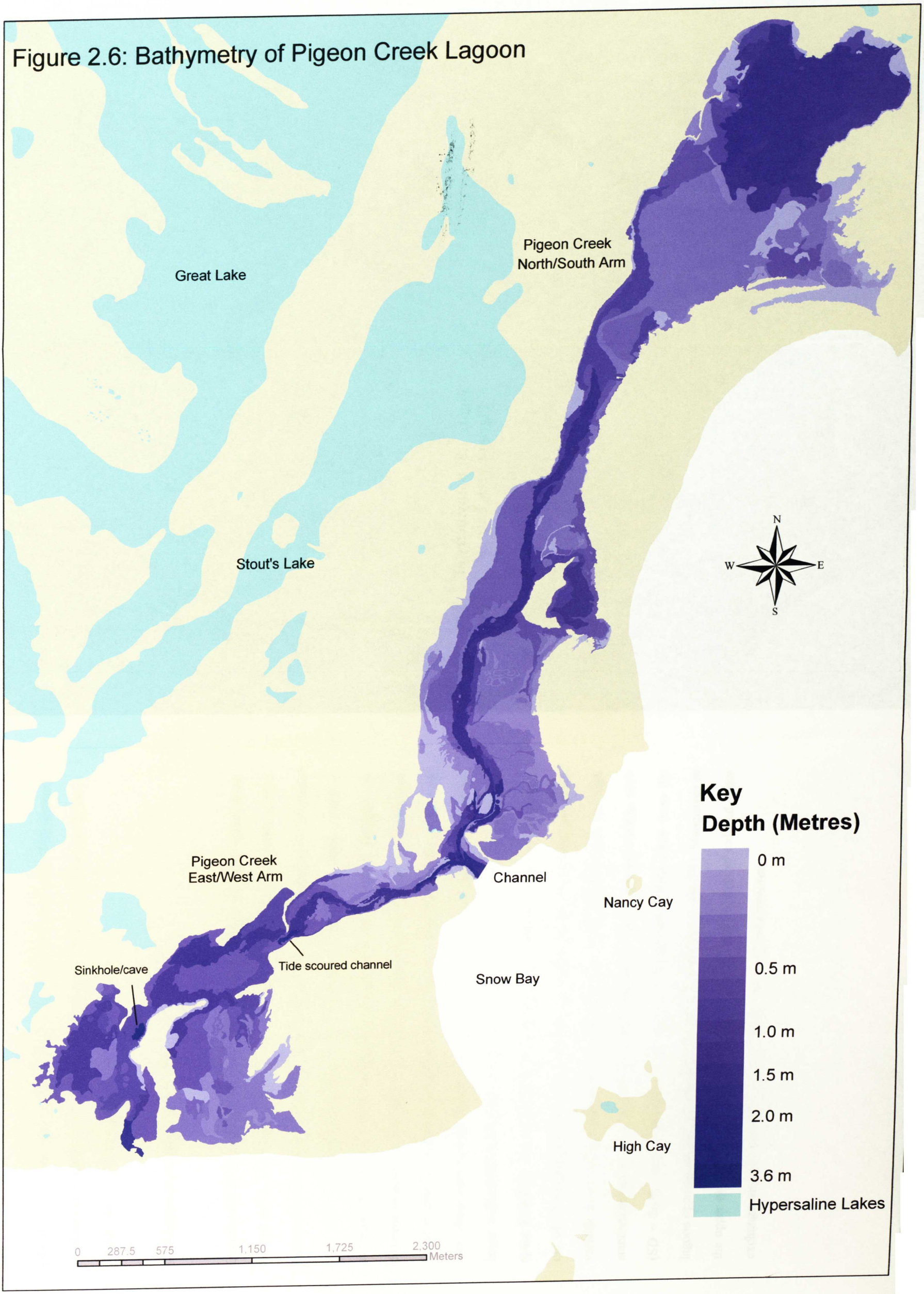
	Seagrass	Macroalgae	Bare Sand/Mud	Rock	Red	Black	Coastal Vegetation
Cluster 1	1	0	13	14	263	3	6
SE	0.67	0.33	2.80	6.89	9.20	1.82	5.30
Cluster 2	180	18	93	3	5	0	0
SE	5.95	5.38	7.06	2.80	3.98	0.00	0.00
Cluster 3	17	6	134	4	135	2	2
SE	2.63	1.02	4.75	1.05	4.09	0.63	0.85
Cluster 4	44	17	204	13	19	2	0
SE	4.60	2.61	6.47	3.73	3.18	1.19	0.25

2.3.3 Bathymetry

In the north/south arm of the lagoon depths ranged from 0 – 2.1 metres (Figure 2.8). From the lagoon opening, a relatively deep (approximately 1 – 2m) tide-scoured channel winds its way north between shallower areas of seagrass, sand, Callianassid shrimp (*Glypturus acanthochirus*) mound sand flats and overwash mangrove islands. This channel terminates approximately 4.5 km north at a point where the lagoon is at its widest. The average depth in the north/south arm is approximately 0.5 m The east/west arm of the lagoon ranges in depth from 0 – 3.6 m, the deepest parts being one small section of a tide scoured channel (2.4m) and a submarine sinkhole and cave which links through subterranean conduits to the ocean (both shown in Figure 2.8). During out going spring tides a small whirlpool forms as water is drawn out of the lagoon to the ocean.

Figure 2.8: Bathymetry of Pigeon Creek Lagoon

Figure 2.6: Bathymetry of Pigeon Creek Lagoon



Like the north/south arm, a tidal channel also runs from east to west. This channel concludes approximately 2.5 km from the main lagoon opening. The average depth in the east/west arm of the lagoon is approximately 0.7m.

2.3.4 Spread of red mangrove

Over the full 57 year period *Rhizophora mangle* in the sample polygons spread from 87 115 m^{-2} in 1942 to 107 771 m^{-2} in 1968 then to 126 007 m^{-2} in 1999, a 45% increase in area overall (Table 2.4). The spread of red mangrove during the 26 years from 1942 – 1968 averaged 794 m^2 yr^{-1}. Over the 31 years from 1968 – 1999 it averaged 591 m^2 yr^{-1}. High variability was seen between mangrove polygons in different locations in the lagoon (Figure 2.9). The greatest increase in spread was found in smaller patches of mangrove in the mid to lower portions of the north/south arm. These were younger stands with little space restriction. There was a tendency for larger well-established stands (> 9000 m^{-2}) to spread at a slower rate perhaps due to space limitation. The spread of *R. mangle* was greater between 1942 and 1968 in 15 out of 23 sample polygons. The area that mangroves spread was greater but more variable in the sample polygons between 1942 and 1968, as reflected in the high standard deviation value of 47.8, compared to sample polygons between 1968 to 1999 (SD = 26.9). Areal spread was less vigorous in polygons furthest away from the lagoon opening, as indicated by the 2nd order polynomials (Figure 2.9). Mangroves in the upper north reaches spread more slowly, perhaps as a function of reduced water exchange, variable and often elevated salinity and water temperatures.

Table 2.4: Area (m^{-2}) of sample polygons digitised from aerial photographs from 1942, 1968 and 1999. The mangrove spread between 1942 - 1968, and, 1968 - 1999, was divided by the number of years between these dates to give an average yearly spread. Percentage area increase for each polygon during each time period is shown.

Red Mangrove Development 1942 - 1999

Sample	Location	1942	% Increase	1968	% Increase	1999
1	Upper North/South	9602	17	11248	6	11908
2	Upper North/South	11209	23	13830	5	14567
3	Upper North/South	3151	27	3995	13	4513
4	Upper North/South	1246	86	2318	86	4315
5	Upper North/South	1288	7	1383	13	1557
6	Upper North/South	4379	46	6387	12	7150
7	Mid North/South	696	43	995	8	1078
8	Mid North/South	45	113	96	64	157
9	Mid North/South	1659	11	1836	32	2425
10	Mid North/South	26	81	47	45	68
11	Mid North/South	1785	26	2252	27	2864
12	Mid North/South	407	74	709	32	937
13	Lower North/South	31	145	76	29	98
14	Lower North/South	1796	22	2196	23	2694
15	Lower North/South	172	192	503	70	857
16	Lower North/South	1205	36	1642	91	3142
17	Lower North/South	11742	18	13835	14	15767
18	Channel	1168	36	1591	78	2829
19	Lower East/West	7122	39	9909	22	12091
20	Lower East/West	20275	3	20852	7	22380
21	Mid East/West	373	107	771	20	925
22	Mid East/West	2237	30	2908	17	3403
23	Upper East/West	5500	53	8394	23	10352
	TOTAL (m^{-2})	**87115**	SD 47.8	**107771**	SD 26.9	**126077**
	TOTAL growth over	26 years	20656 m^{-2}	31 years	18306 m^{-2}	
	TOTAL m^2 yr^{-1}	1942-68	794 m^2 yr^{-1}	1968-99	591 m^2 yr^{-1}	

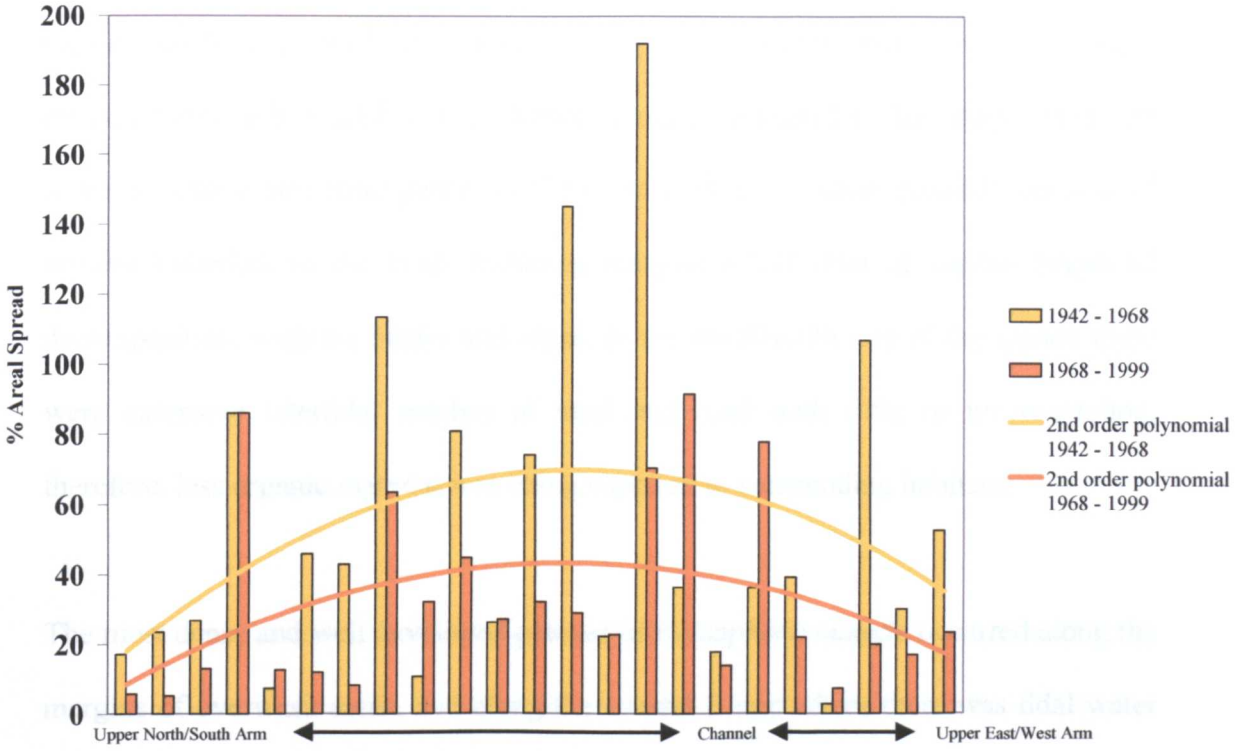


Figure 2.9: Percentage Areal spread in 23 *Rhizophora mangle* polygons in Pigeon Creek Lagoon between 1942 – 1968 (yellow bars) and 1968 – 1999 (orange bars).

2.4 Discussion

The distribution of different habitats and their development appears to be linked to the oceanographic influences in the lagoon, such as water depth, water exchange and current velocities. Seagrass and macroalgae cover is minimal in very shallow areas that are exposed at low tide, although one area at the entrance to the east/west arm which has dense seagrass cover is partially exposed during very low spring tides. Where tidal channels are shallow (<1m) and the flow rate of tidal water is fast seagrass densities did not usually exceed 40% cover. However in deeper channels where flow velocities were less, seagrass and macroalgae grew well. The greater

relative coverage of subtidal and intertidal vegetation in the east/west arm of the lagoon may be a result of nutrient availability, greater average depths resulting in less intertidal area or less tidal current. Although not investigated in this study, substrates in the east/west arm were generally finer and darker in colour, possibly because of organic materials in the mud, including mangrove leaf litter at various stages of decomposition, seagrass blades and algae. In the north/south arm of the lagoon there were extensive intertidal patches of sand and mud with little or no vegetation, therefore, less organic material was being supplied to surrounding habitats.

The most dense and well developed patches of *Rhizophora mangle* occurred along the margins of overwash areas, and along the coastal fringe where there was tidal water movement exchanging seawater. The foliage thickness and tree density and height were noticeably reduced in intertidal overwash stands.

Viewing Pigeon Creek on a lagoon wide spatial scale, there appears to be a homogeneous pattern of habitat attribute distribution. The upper north/south arm was characterised by relatively limited red mangrove and seagrass cover and sand/mud attributes dominated. Moving south from the mid north/south arm to the lagoon channel, tidal flow and water exchange increased as did the coverage of mangrove, seagrass and macroalgae. In the east/west arm, mangrove cover was relatively high in proportion to the overall area and sand/mud coverage was minimal with seagrass and macroalgae cover dominating.

At a smaller spatial scale there appears to be a greater heterogeneity in attribute distribution with adjacent polygon often being composed of significantly different

proportions of various attributes. The relationships between habitat and juvenile fish distribution are investigated in Chapter 4.

The spread of mangrove over an extended period of 57 years may be connected to annual climatic variations. There were over three times more hurricanes recorded for the Bahamas between 1940 and 1969 compared to 1970 – 1999. Yet, the spread of the trees was more vigorous during the former period. Despite living under stressed conditions the red mangrove trees on San Salvador appear to be quite resilient over an extended period to hurricane damage. Perhaps the additional stress imposed by episodic climatic events encourages the production and dispersal of more propagules, and therefore an increased rate of spread. Growth varied between patches distributed throughout the lagoon, and this was possibly related to variable water exchange, as supported by the results showing slower spread of mangrove in the upper north/south arm. In addition, mangroves spread largely through propagule distribution which may become limited as mangroves stands grow out into deeper water, where propagules are less likely to penetrate the substrate below, as they fall from mature trees.

A number of studies have documented variation in spread of mangrove over time, but usually in terms of declining coverage due to coastal development and aquaculture (EJF 2004). Like many other parts of the world, mangrove habitat in the Bahamas is being subjected to increased development pressure. Red mangrove areas have been destroyed in a number of locations, most notably in Nassau (New Providence), Freeport (Grand Bahama), and Marsh Harbour (Abaco), for mosquito control and water front access (Buchan 2000).

Mangroves are exploited around the world for numerous reasons including timber and charcoal production and the production of tannins. Mangrove areas are converted for aquaculture and agriculture, salt production, coastal residential and industrial development and tourism (EJF 2004). However, mangroves are important for coastal defence, sediment stabilisation, and as a food source for many marine organisms, and as a fin and shellfish habitat. It is estimated that up to 60% of the world's mangroves have already been lost (Spalding *et al.* 1997), and the effect on wild fisheries in some areas has been significant. For example, in Bangladesh, deforestation of the Chokoria Sundarban forest from 7500 hectares to less than 500 hectares over a 23 year period resulted in an 80% drop in catch (EJF 2004). Moreover, mangrove deforestation in Kenya resulted in decreased fish and shrimp stocks, and reduced coastal protection (Fondo and Martens 1998). Indeed, recent studies have shown mangroves are an obligate nursery habitat for some species of juvenile fish (Nagelkerken *et al.* 2002).

Studies describing red mangrove's function as juvenile fish habitat (Nagelkerken *et al.* 2000a, Nagelkerken and van der Velde 2002, Cocheret de la Morinière *et al.* 2002, Mumby *et al.* 2004) would suggest that there is potentially a massive influence on inshore fish stocks from the large area of mangrove in the Bahamas. However, it is not clear to what extent mangrove habitat is utilised by juveniles, or whether some areas are more productive than others in terms of harbouring more individuals.

Chapter 3

The Physical Environment of Pigeon Creek Lagoon

3.1 Introduction

The Bahamas archipelago spans six degrees of latitude and nine degrees of longitude across the Tropic of Cancer (Figure 1.2). Consequently, there are regional variations in climatic conditions throughout the chain of islands. The climate is sub-tropical and has been described as having distinct winter and summer regimes (Halkitis *et al.* 1982). During the winter southward moving cold air masses stream over the islands from the United States, although moderated by the Gulf Stream, these fronts can reduce air temperature in the northwestern Bahamas significantly. In the summer warm moist air moves northwards from the Caribbean. The islands in the north on average are cooler and have higher precipitation than those in the south.

Average rainfall in Grand Bahama, the northernmost island, is twice that of Great Inagua in the South at 1400mm and 700mm respectively (Figure 3.1). Temperature in Great Inagua (Figure 3.2) is generally greater than Nassau and Grand Bahama, in particular during the winter months. Annual maximum and minimum mean monthly temperature in Great Inagua are 29°C and 25°C compared to 27°C and 20°C in Grand Bahama (Shaklee, 1996). Precipitation and air temperatures in San Salvador, are similar to that of Nassau on New Providence Island. Mean annual rainfall in San Salvador is approximately 1130 mm compared to 1178 mm in Nassau, average monthly air temperatures for both islands are approximately 25°C, and is indicative of islands in the central Bahamas, such as Cat Island, Long Island, Exuma Cays and Eleuthra (Figure 3.3).

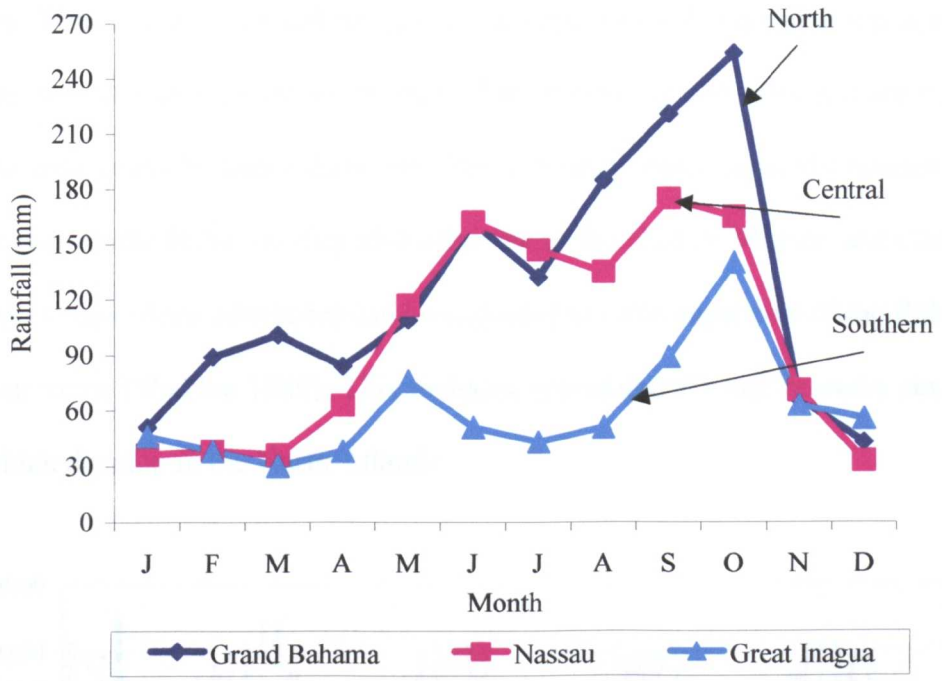


Figure 3.1: Mean monthly rainfall (mm) in the northern, central and southern Bahamas (Data from Shaklee 1996).

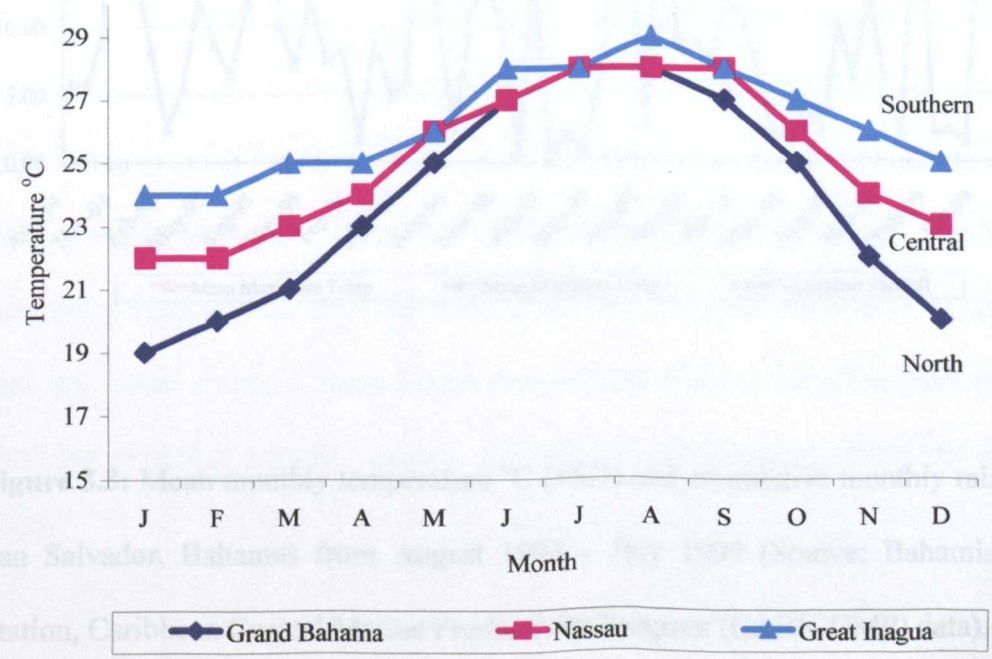


Figure 3.2: Mean monthly air temperatures (°C) for the northern, central and southern Bahamas (Data from Shaklee 1996)

The Bahamas are exposed to significant hurricane and tropical storm activity during the late summer (August to October). The islands are low lying and are located along the path taken by many damaging North Atlantic hurricanes. Hurricanes and storms impacting the Bahamas may also originate in the Gulf of Mexico and Caribbean Sea. On average three hurricanes can be expected to cross some part of the Bahamas every four years (Shaklee 1989). This includes approximately one in every seven of those which develop in the North Atlantic.

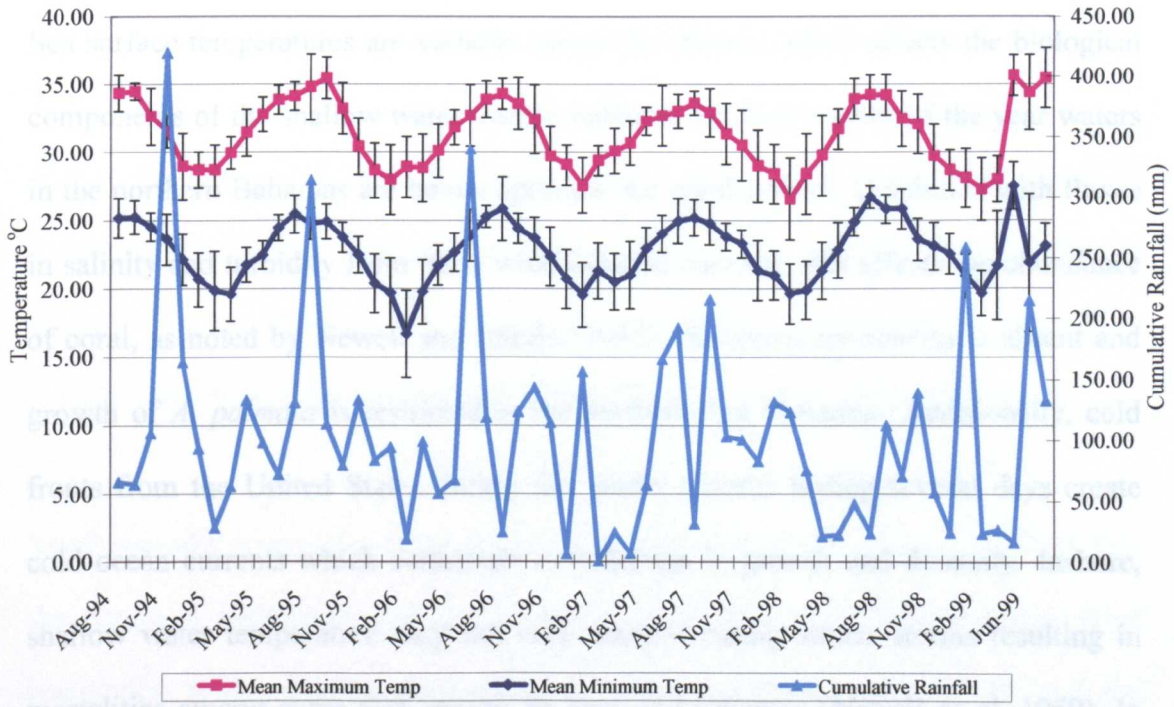


Figure 3.3: Mean monthly temperature °C (±SD) and cumulative monthly rainfall for San Salvador, Bahamas from August 1994 – July 1999 (Source: Bahamian Field Station, Caribbean Coastal Marine Productivity Program (CARICOMP) data).

Warm ocean currents and sea surface water temperatures influence the air temperature throughout the archipelago. Currents affecting the Bahamas originate from two

places. The Gulf Stream, which passes between Florida and the Bahamas from the Caribbean Sea and the Gulf of Mexico, and the Antilles Current, which flows into the archipelago from the west, originating from the North Equatorial Current. The Gulf Stream has a fairly constant path, but the Antilles Current shifts to the north in the summer creating warmer temperatures in the northern Bahamas, and to the south during the winter months providing warmer temperatures to the southern islands (Shaklee 1996).

Sea surface temperatures are variable across the islands, which affects the biological components of the shallow water marine habitats. For five months of the year waters in the northern Bahamas are below optimum for coral growth. Combined with fluxes in salinity and turbidity from trade wind induced currents, this affects the abundance of coral, as noted by Newell and Imbrie (1955). *Acropora cervicornis* is absent and growth of *A. palmata* is restricted in the northwestern Bahamas. Additionally, cold fronts from the United States during the winter months lasting several days create cold ocean currents which contribute to reduction in growth and diversity. Inshore, shallow water temperature may fall very quickly during winter storms resulting in mortalities among some fish species in bays and estuaries (Newell *et al.* 1959). In contrast, recent summer ocean temperatures in the Central Bahamas have exceeded 30°C for extended periods, causing extensive coral bleaching (McGrath & Smith 1999).

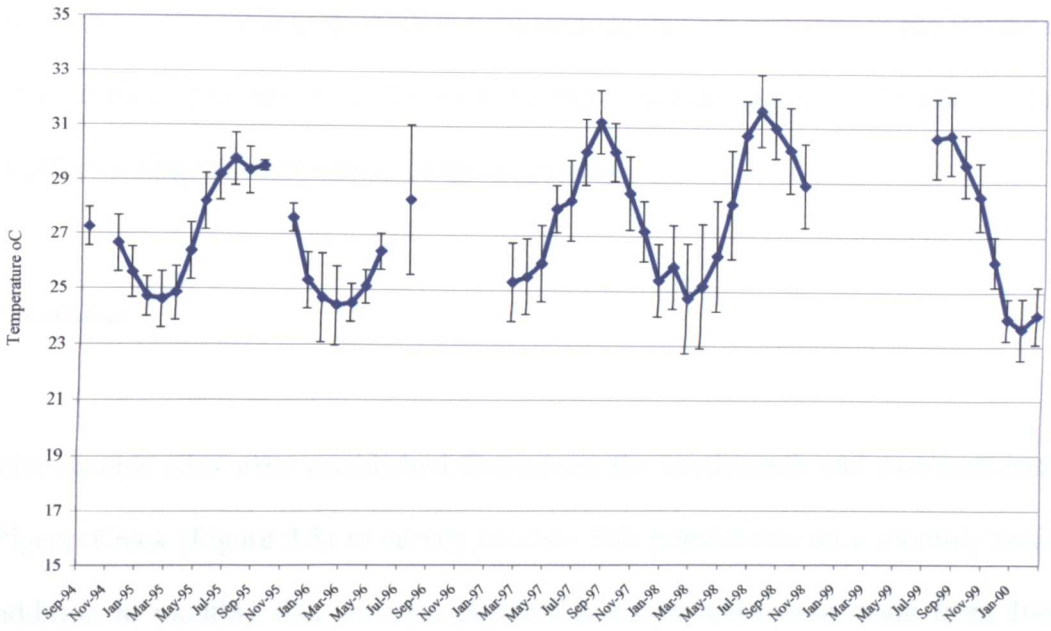


Figure 3.4: Mean seawater temperatures were recorded using automated Onset® Stowaway Temperature Loggers at three sites around San Salvador island. Recorded in depths ranging from 6 – 13m in seagrass and coral reef habitat (Error bars = SD). (Missing data due to disappearance of loggers during storms or battery failures).

Mean seawater temperatures around San Salvador ranged from 23.6 – 31.6 °C during the period of September 1994 to February 2000 (Figure 3.4). Temperatures varied seasonally, with coldest temperatures in January, February and March and the warmest in July and August.

Tidal range throughout the Bahamas is approximately 1.5 metres and is a semi-diurnal mixed type (Sullivan 1991) with four tidal extremes per day.

Salinities are fairly consistent along the platform margins of the Bahama Banks at around 35 $^{o}/_{oo}$, but may be higher across the shallow banks due to evaporation.

Evaporation is also evident in shallow tidal lagoons that are common in the Bahamas, but no detailed work has been done on the physical oceanographic parameters that may affect biological components of these systems.

3.2 Methods

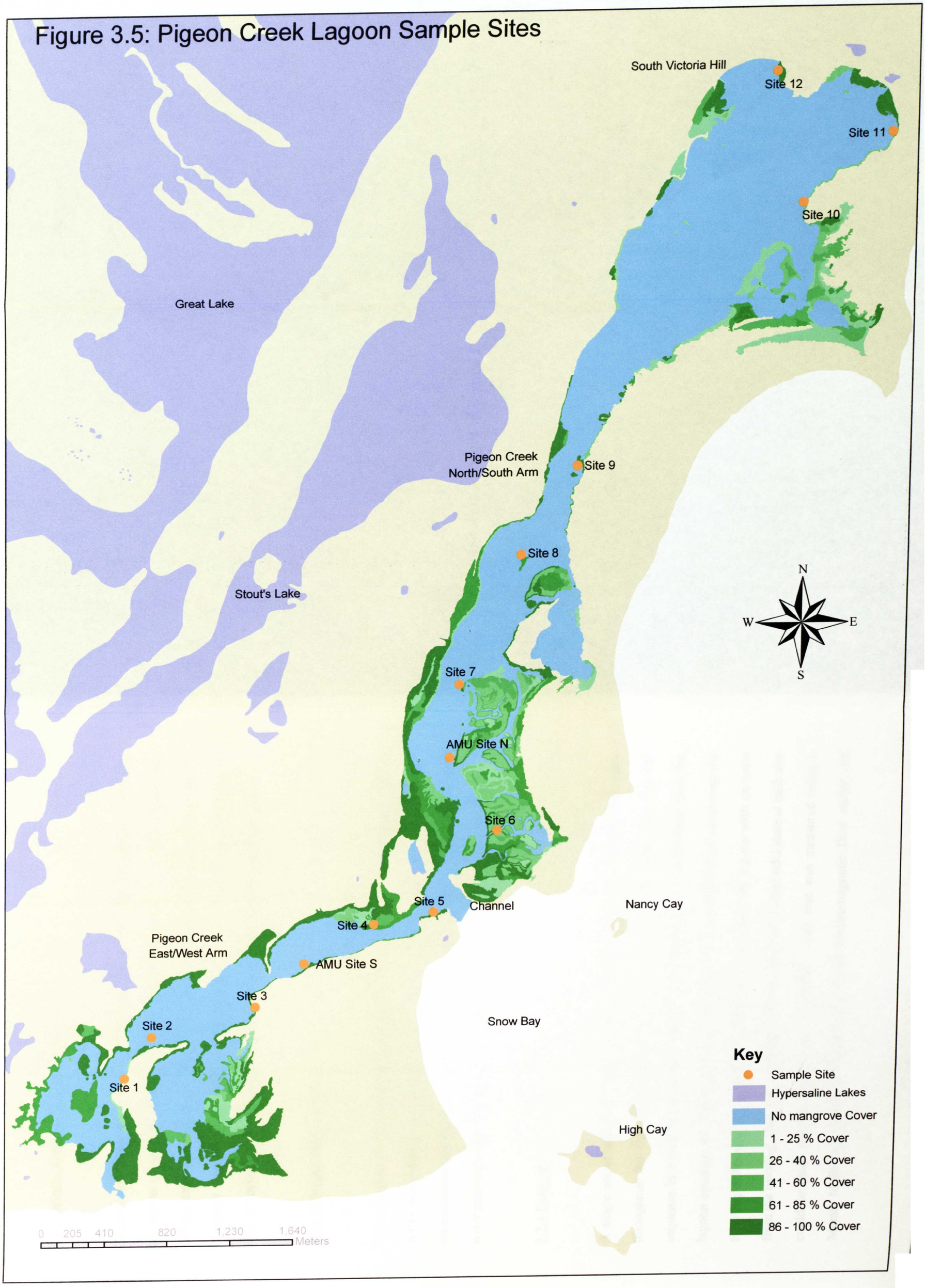
Twelve sample sites were established throughout the north/south and east/west arms of Pigeon Creek (Figure 3.5) to survey juvenile fish populations on a monthly basis. In addition to monthly fish surveys, physical measurements were made from June 1999 to March 2001, except during September in each sample year (Appendix II).

3.2.1 Water temperature

Water temperature was measured using four automated Onset® Stowaway Temperature Loggers. These were programmed (launched) using Logbook® for Windows software, placed in underwater housings and deployed at sites 1, 5, 7, and 12 (Figure 3.5). They were attached to mangrove prop roots out of direct sunlight at 30 – 60 cm below the surface so they always remained submerged. Each logger recorded temperature every hour for up to three months at a time from November 1998 to August 2000. However, using data loggers proved to be problematic. Numerous battery failures meant that data was recorded sporadically at each site. Therefore data was averaged for each month and summarised for each site (Table 3.1 and 3.2, Figure 3.6)

Figure 3.5: Pigeon Creek Sample Sites

Figure 3.5: Pigeon Creek Lagoon Sample Sites



3.2.2 Salinity, dissolved oxygen and pH

On each sample day at sites 1 - 12 water samples were drawn from approximately 15 cm depths (a total of 20 measurements at each of 12 sites: n = 240), to measure salinity using a refractometer (Sper Scientific), and dissolved oxygen using a HACH Company AccuVac high range dissolved oxygen test kit. pH was recorded using a HACH Pocket Pal pH meter, the instrument sensor being held just below the water.

3.2.3 Tides and tidal fluctuation

From August 1999 five automated pressure loggers (Solinst® Levelogger Model 3001) were deployed at sites 1, 3, 5, 7, & 11 and attached to mangrove roots approximately 30 cm – 60 cm below the surface. Loggers were programmed to record water pressure every 15 minutes for a period of 4 months.

3.2.4 Flow rates

A single set of measurements was made at each sample site to compare flow rates throughout the lagoon. Sampling was done on an incoming neap tide, and the sequence in which the sites were sampled was dependent on their distance from the lagoon opening, the site closest to the channel being sampled first. Considering the tidal lag difference which was determined to occur along the lagoon with distance from the opening, flow rate sampling "followed the tide" so that tidal state at each site could be more closely matched and compared. Flow rate was measured using a Marsh McBirney Flowmate® 2000 with digital electromagnetic flow meter and

velocity probe. A measurement was recorded approximately every 2.5 metres parallel to, and 0.5 m from the mangrove fringe, and then 3 m from the fringe. Readings for each series (0.5 and 3 m) were averaged.

3.3 Results

3.3.1 Water temperature

During the period of study, average water temperatures ranged between 21.8 – 31.1°C (Table 3.1). Figure 3.6 clearly shows a seasonal oscillation, with average temperatures varying up to 9.3 °C from summer to winter. The full extent of the summer/winter temperature fluctuations is shown more clearly in Table 3.2 in which the temperature data from sites 5, 7, and 12 are compared. Temperature ranges exceed 20°C at sites 5 and 7, and were as low as 13.9 °C at site 1 in February 1999 and as high as 38°C at site 5 in July 1999. There was little difference in mean water temperatures between sites ($\leq$ 0.6°C), and maximum temperatures varied by < 0.7 °C. Site 1 at the western end of the east/west arm of the lagoon had the lowest minimum temperature of 13.9°C, and was perhaps influenced by cool subterranean water flowing slowly into the lagoon from a submarine cave located in close proximity to the site. Higher minimum temperatures were found at site 12 (17.8°C) in the upper reaches of the north/south arm where water mixing with cooler oceanic waters was least.

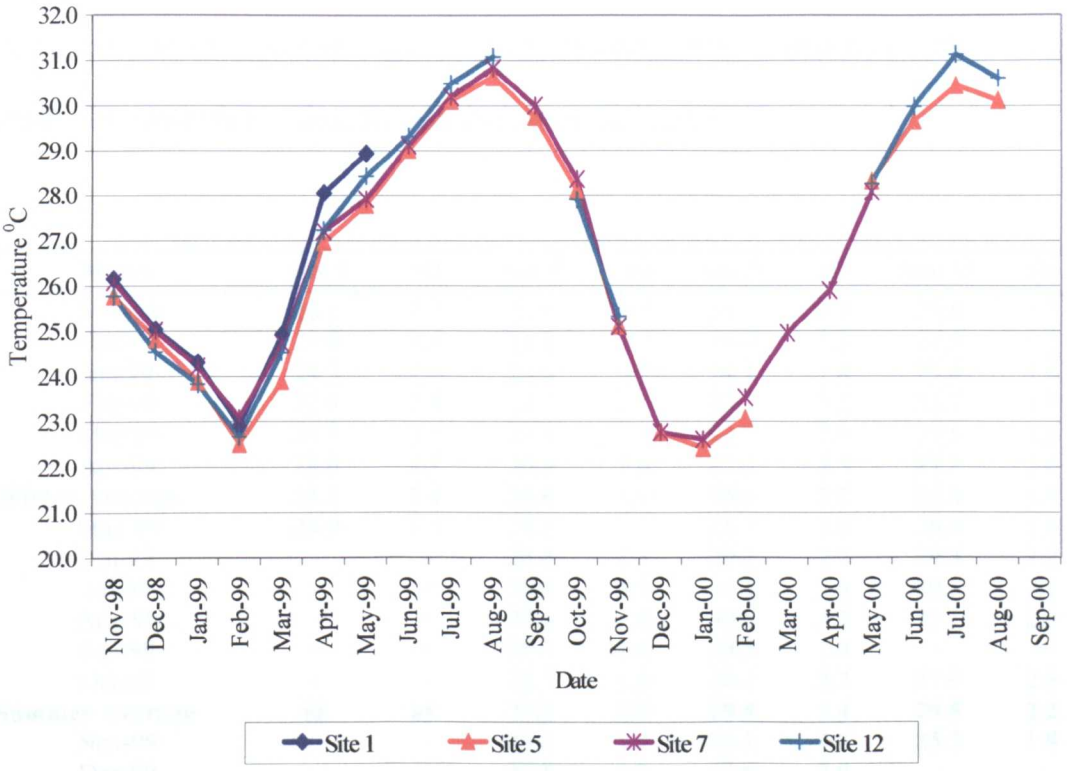


Figure 3.6: Average seawater temperatures recorded at four sample sites using Onset® Stowaway Temperature Loggers from November 1998 – August 2000.

Table 3.1: Mean monthly water temperatures and seasonal averages with standard deviations, at four sites in Pigeon Creek, recorded from November 1998 – August 2000. (id = insufficient data for calculation of averages)

Month	Site 1	SD	Site 5	SD	Site 7	SD	Site 12	SD
Nov-98	26.1	2.0	25.8	1.5	26.1	2.2	25.8	1.7
Dec-98	25.0	1.5	24.8	1.0	25.0	1.5	24.5	1.2
Jan-99	24.3	2.0	23.9	1.5	24.2	1.8	23.8	1.6
Feb-99	22.9	2.8	22.5	2.1	23.1	2.2	22.7	1.9
Mar-99	24.9	3.5	23.9	2.6	24.7	2.9	24.5	2.6
Apr-99	28.0	2.7	26.9	2.6	27.2	2.5	27.2	2.4
Winter Average	**25.2**	**2.4**	**24.6**	**1.9**	**25.1**	**2.2**	**24.8**	**1.9**
May-99	28.9	2.1	28.3	2.2	28.7	2.8	28.8	2.0
Jun-99	-	-	28.8	2.5	29.1	2.7	29.3	2.2
Jul-99	-	-	30.0	2.5	30.2	2.6	30.5	2.1
Aug-99	-	-	30.6	1.8	30.8	2.1	31.1	2.0
Sep-99	-	-	29.7	1.4	29.5	1.9	-	-
Oct-99	-	-	28.1	1.8	28.4	2.2	27.9	2.6
Summer Average	**id.**	**id.**	**29.2**	**2.0**	**29.5**	**2.4**	**29.5**	**2.2**
Nov-99	-	-	25.1	1.4	25.1	1.8	25.3	1.9
Dec-99	-	-	22.8	1.5	22.6	2.0	-	-
Jan-00	-	-	22.4	2.0	21.8	2.5	-	-
Feb-00	-	-	23.1	1.5	23.8	2.4	-	-
Mar-00	-	-	-	-	25.0	2.7	-	-
Apr-00	-	-	-	-	26.8	3.0	-	-
Winter Average	-	-	**23.3**	**1.6**	**24.2**	**2.4**	**id.**	**id.**
May-00	-	-	28.3	1.4	28.1	3.0	28.3	2.3
Jun-00	-	-	29.7	2.7	-	-	30.0	1.7
Jul-00	-	-	30.5	2.2	-	-	31.1	1.8
Aug-00	-	-	30.1	2.0	-	-	30.6	1.5
Sep-00	-	-	-	-	-	-	-	-
Summer Average			**29.6**	**2.1**	**id**	**id**	**30.0**	**1.8**

Table 3.2: Summary statistics of temperature data recorded between November 1998 and October 1999 by Onset® Stowaway Temperature Loggers at three sites in Pigeon Creek, San Salvador, Bahamas. Site 1 is omitted because no data was recorded for the winter months during this sample period.

	Site 5	Site 7	Site 12
Mean Temperature °C	26.89	27.23	26.88
Standard Deviation	3.23	3.40	3.43
Maximum Temperature °C	37.62	37.98	37.32
Minimum Temperature °C	15.81	16.64	17.85
Range	21.81	21.34	19.47
Number of Data Points	8348	8339	7401

3.3.2 Salinity, dissolved oxygen and pH

Salinity measurement extremes ranged from 30 – 47 $^{0}/_{00}$ during the period of study. Values did not vary significantly between sites 1 – 9 and sites 10 – 12 (Kruskal-Wallis one-way ANOVA on ranks, $p > 0.05$). However there was a significant difference between the two sets of sites ($p < 0.001$, Mann-Whitney rank sum test). Averaging between 36 and 39 $^{0}/_{00}$, salinities were higher and more variable (Figure 3.7) in the upper reaches of both lagoon arms, and were most consistent near the lagoon opening. In general, salinity values tended to increase with distance from the lagoon opening where the influence of tides and ocean water mixing became less.

Table 3.3: Mean values (± SD) for salinity, dissolved oxygen and pH at twelve sample sites in Pigeon Creek Lagoon, San Salvador, Bahamas.

Site	1	2	3	4	5	6	7	8	9	10	11	12
Dissolved Oxygen ($mg\ l^{-1}$)	5.0	5.1	5.0	5.3	4.8	5.2	5.1	4.9	4.8	4.7	4.5	4.6
SD	1.1	1.1	1.1	0.7	0.8	0.7	0.9	0.7	1.0	0.8	0.8	0.8
pH	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.2	8.2	8.1	8.2
SD	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.1
Salinity ($^{o}/_{oo}$)	37	37	36	36	36	36	37	36	38	39	39	39
SD	2.6	2.6	2.5	1.6	1.4	1.7	2.6	2.1	2.9	3.8	3.4	3.8

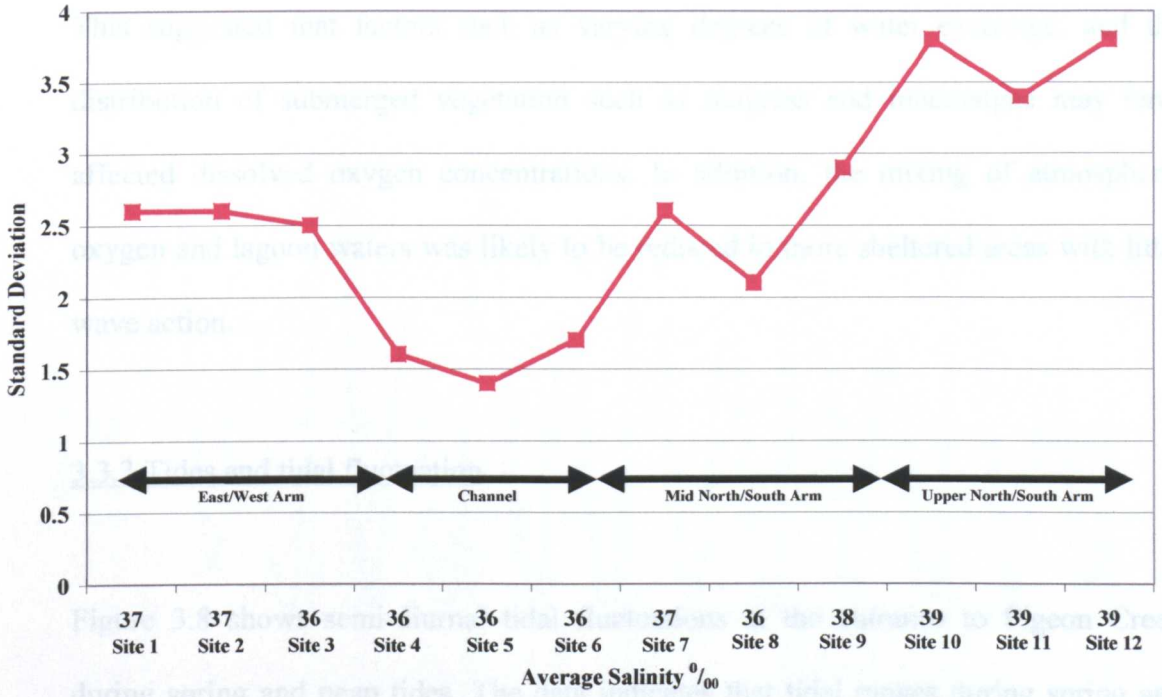


Figure 3.7: Average salinities at twelve sample sites in Pigeon Creek lagoon. Salinity was recorded monthly from June 1999 to March 2001. Higher standard deviation values indicate more variability around the mean salinity values shown on the X axis.

pH values had a limited range from 7.9 – 8.5, and did not vary significantly between sites 1 - 9 or sites 10 – 12 ($p > 0.05$, Kruskal-Wallis one way ANOVA on ranks). However pH values did vary significantly between the two groups of sites ($p < 0.001$, Mann-Whitney rank sum test) over the sampling period with sites 10 – 12 having consistently lower pH values. Average values ranged from 8.1 – 8.3 (Table 3.3).

The concentration of dissolved oxygen ranged from 2.2 – 7.4 mg l^{-1}, and averaged 4.9 mg l^{-1} (SD = 0.88). Although not varying significantly between sites, dissolved oxygen values were generally lower in the northern reaches of the Creek (Table 3.3). This suggested that factors such as varying degrees of water exchange, and the distribution of submerged vegetation such as seagrass and macroalgae may have affected dissolved oxygen concentrations. In addition, the mixing of atmospheric oxygen and lagoon waters was likely to be reduced in more sheltered areas with little wave action.

3.3.3 Tides and tidal fluctuation

Figure 3.8 shows semi-diurnal tidal fluctuations at the entrance to Pigeon Creek during spring and neap tides. The data indicates that tidal ranges during spring and neap tides were approximately 1.0 m and 0.6 m respectively, but it was expected that these ranges would vary throughout the year during stronger spring tides and as a result of storm surge. Figure 3.9, shows tides recorded at three sites (1, 5, and 11) in the lagoon over a five day period. The plot displays clearly the tidal range at each site and the tidal lag between them. Site 5, nearest the lagoon opening had the greatest fluctuation with a tidal range of 0.7 – 0.8m. Site 1, which was located 2.4 km from the

lagoon opening, had a tidal range of around 0.5 – 0.6m, and reached high tide approximately 2 hours after site 5. Site 11 located 5.9 km from the channel had a tidal range of 0.3 m. At site 11, the tide reached its highest point approximately 3 hours after site 5. Interestingly, when looking at the slope of the lines on the incoming and out going tides for each site (Figure 3.9), the tide advanced and receded quickest at the channel (site 5) and then at site 1. The speed of the incoming and out going tides at each of these sites was very similar and uniform as shown by the symmetrical waves in the plot. However, it appears from the non-symmetrical waves in the data for site 11 in the far north of the lagoon, that the advancing tide is quicker than the receding tide (see A).

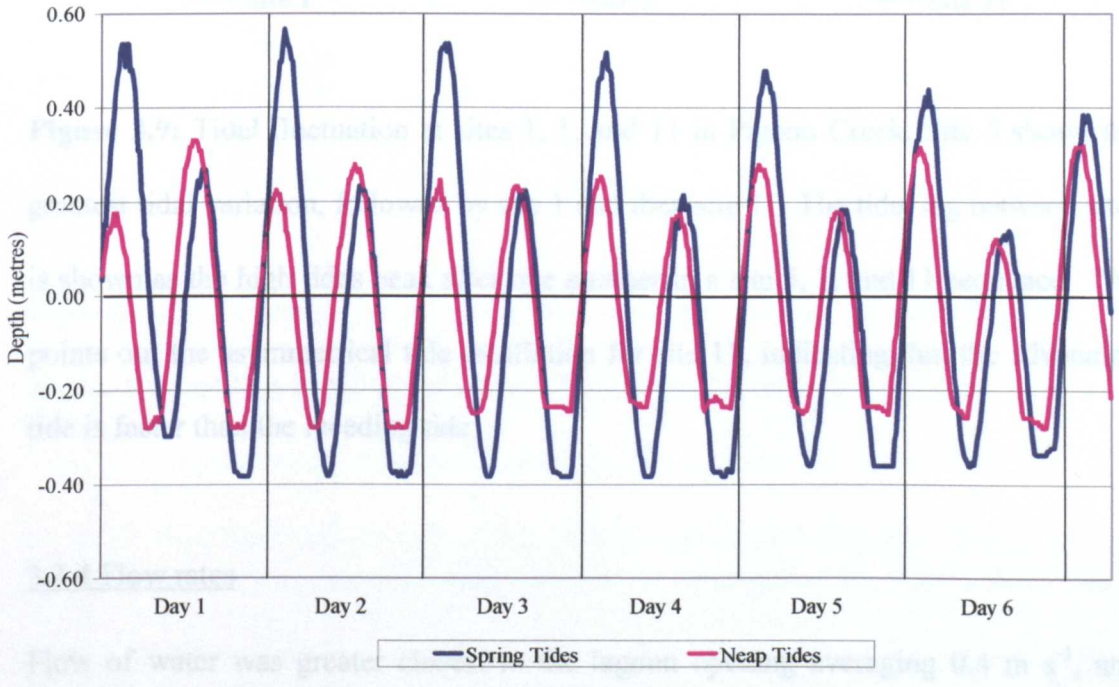


Figure 3.8: Spring and neap tidal fluctuations at the lagoon opening (site 5) of Pigeon Creek.

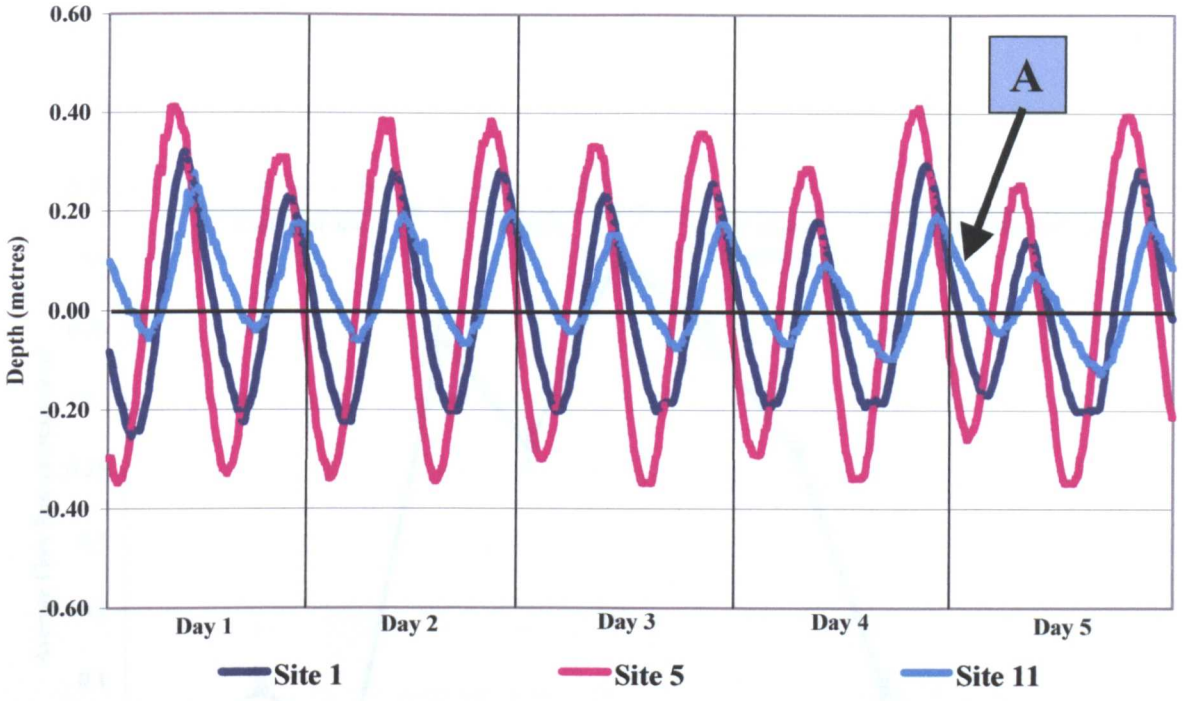


Figure 3.9: Tidal fluctuation at sites 1, 5, and 11 in Pigeon Creek. Site 5 shows the greatest tidal variation, followed by site 1 and then site 11. The tidal lag between sites is shown as the high tides peak after one another in a site 5, 1, and 11 sequence. "A" points out the asymmetrical tide oscillation for site 11, indicating that the advancing tide is faster than the receding tide.

3.3.4 Flow rates

Flow of water was greater closest to the lagoon opening averaging 0.4 m s^{-1}, and water movement was negligible in the far north of the lagoon at approximately 0.01 m s^{-1} (Figure 3.10). A reduced flow rate at site 5 was expected as this site was protected by a small beach west of the channel opening which deflected water flow out to the centre of the east/west channel. However, flow rates increased further along the

transect as the mangrove fringe angled out towards the channel, and as distance increased from the beach.

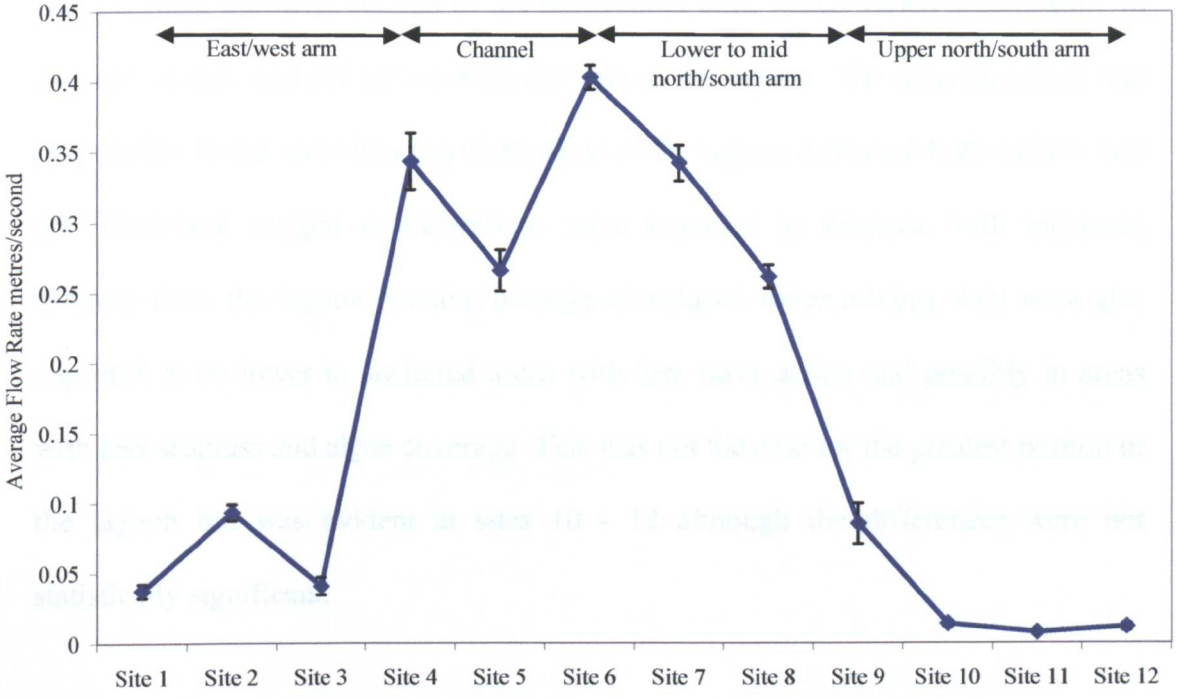


Figure 3.10: Average flow rates (±SE) recorded parallel to and 3m from the *Rhizophora mangle* fringe at twelve sample sites in Pigeon Creek lagoon.

Flow rate at site 2 was approximately double that of neighbouring sites 1 and 3. Site 1 experienced low flow rates not only because of its distance from the lagoon opening, but also because it was protected down stream by mangrove fringe which stifled the water flow. Site 3 was located in a small bay, one end of which deflected water flow beyond the site. Site 2 protruded out into the centre of the east/west arm of the lagoon and was exposed to slightly more water flow. Other flow rate velocities correlated with distance from the lagoon opening those closest having higher flow rates.

3.4 Discussion

The patterns of salinity, dissolved oxygen, pH and temperature data from Pigeon Creek suggest limited variability throughout most of the lagoon. The exception to this was the most northerly section of the north/south arm, which varied significantly in average salinity and pH values from the rest of the lagoon. The data suggested that evaporation in the slow flowing wider parts of the lagoon increased both salinity and pH. Dissolved oxygen concentrations were expected to decrease with increased distance from the lagoon opening because of reduced water mixing, they were also expected to be lower in sheltered areas with less wave action and possibly in areas with less seagrass and algae coverage. This was not the case for the greatest portion of the lagoon but was evident at sites 10 - 12 although the differences were not statistically significant.

Mean water temperatures were very similar between sample sites during both summer and winter, although individual sites demonstrated unique and highly variable temperature fluctuations in excess of 19°C. There were a number of potential influences on water temperatures at each site. Firstly, tidal water exchange was likely to create more temperature variability, where solar heated water was exchanged with cooler oceanic water on each tidal cycle. Thus, sites with less water exchange had less temperature variability throughout the day. Secondly, water covering shallow sand flats was likely to heat up more, relative to deeper areas of the lagoon, especially during periods of reduced water flow at the turn of the tide. A number of mangrove areas fringing shallow sand flats in the lagoon exhibited higher water temperatures on an out going tide as waters flowed off the flats.

The greatest physical differences between sites were seen in water flow and tidal fluctuation. The volume of water exchange (Figure 3.9), and flow rates (Figure 3.10) were clearly limited with increased distance from the lagoon opening.

Water exchange and tidal flow were important factors affecting water temperatures, dissolved oxygen concentrations, salinity and pH, maintaining these parameters at fairly consistent levels in most parts of the lagoon.

Variable flow rates and tidal fluctuations throughout Pigeon Creek were presumed to be influential in the dispersal of fish larvae and may be important factors affecting the distribution of juvenile fish with in the lagoon.

Chapter 4

Fish Community Structure and Physical Influences on Distribution in Pigeon Creek

4.1 Introduction

Recent research has reinforced the hypothesis that mangrove and other shallow bay and lagoon habitats have an important nursery function for reef fish (Laegdsgaard and Johnson 1995, Nagelkerken *et al.* 2000, Nagelkerken *et al.* 2002, Cocheret de la Morinière *et al.* 2002, Mumby *et al.* 2004). Most studies to date have inferred the nursery function of mangrove and seagrass biotopes through the overwhelming abundance of juvenile reef fish compared to adults found in these habitats. Beck *et al.* (2001) questioned the validity of this inference. They suggested that a habitat is a nursery for a particular species if its contribution per unit area to the production of individuals that recruit to adult populations is greater, on average than production from other habitats in which juveniles occur. Although a habitat may support high densities of juveniles, if these individuals never reach adult populations, then that habitat does not function as a productive nursery. Therefore in some cases it may be unsound to accept that higher densities of juveniles in a particular habitat contribute more to the adult population than areas with lower densities. However, for juvenile reef fish in shallow water seagrass and mangrove biotopes in the Caribbean, ontogenetic migrations to coral reef habitats have been clearly shown (Cocheret de la Morinière *et al.* 2002, Cocheret de la Morinière *et al.* 2003, Nagelkerken and van der Velde 2003). In addition, a comparison of juvenile fish in bays with and without seagrass and mangrove habitat showed a reduced abundance of some species where mangrove and seagrass habitat was absent, indicating a species specific dependence on these biotopes (Nagelkerken *et al.* 2001). Moreover, on a larger scale, adult populations of reef fish sampled on coral reefs around islands with and without mangrove showed a reduction in the abundance of 65% of the species sampled in

areas without this habitat. This indicated that the composition and abundance of adult fish populations on coral reefs was dependent on the presence/ absence of mangrove habitat on adjacent shorelines (Nagelkerken *et al.* 2002).

Mangrove prop root habitat is important for post-larval and sub-adult reef fish as it is a food rich, complex structure which provides protection from predators. However, although it has been established that juvenile fish utilise this biotope, distribution within a stand of mangroves can vary significantly and for the purpose of management, determining the factors affecting this distribution would be useful when considering both coastal development and incorporation of mangrove areas in marine reserve design.

Many researchers have attempted to census fish populations in complex vegetated areas such as salt marshes, seagrass beds and mangroves with varying degrees of success (Thayer *et al.* 1987, Morton 1990, Robertson and Duke 1990, and Mullin 1995). Many have used toxins or destroyed part of the area being sampled in order to establish elaborate trapping mechanisms. Some studies have been dependent on fish taking a particular route into flume nets on tides receding from mangrove stands. In the present study, a visual census technique was used to survey juvenile fish populations in mangrove prop root habitat. The visual census method does have some notable disadvantages in identifying more cryptic species (Willis 2001) and may not differentiate between congeners with similar appearance, especially in large mixed schools. However, advantages to this method are that it is non destructive, relatively quick to perform, and could be carried out by a single investigator, which was a necessary condition in this case. Furthermore, the visual census method was

appropriate for Pigeon Creek because in contrast to many study locations described in the literature, the visibility of the lagoon waters was very good. To date, little quantitative sampling of mangrove habitat has been done in the Bahamas, with the exception of a recent study by Newman and Gruber in Bimini (2002) who compared macro-invertebrates and fish in mangrove and seagrass habitat.

This chapter describes the composition, distribution and seasonality of icthyofauna in the mangrove prop root habitat of Pigeon Creek. The influence of physical factors such as tidal flow, dissolved oxygen concentration, salinity, depth, distance from the lagoon opening and lunar phase on the abundance and distribution of juvenile fish is investigated. Utilising habitat data from Chapter 2, the relationship between lagoon habitats and fish distribution is considered.

4.2 Methods

Twelve sampling sites were established throughout Pigeon Creek (Figure 3.5). Sites had a fringe of red mangrove (*Rhizophora mangle*) a minimum of 1.5 metres width, in average water depths of 20 – 75 cm. At each site, a 50 m belt transect, 2 m wide (100 m^{-2}) was established. The belt transects covered the most dense outer edge of the prop roots, extending 1.5m deep into the root complex and 0.5m to seaward of the root fringe. Visual fish counts were carried out while swimming slowly along the transect. Survey times were 10 - 25 minutes depending on the number of fish being counted, and due care was taken not to recount fish that moved amongst the prop roots. Data recorded included species, abundance and size classes (Total Length TL) of the fish (< 5cm, 5 – 10 cm, 10 – 15 cm, 15 – 20 cm, 20 – 30 cm. 30 – 40 cm & > 40 cm).

Congeneric groups of fish similar in appearance (e.g. juvenile Scarids, Gerreids and Haemulids) and difficult to identify in large mixed schools were identified to family level. Counts of Atherinids, which occurred in schools often in excess of 1000 fish, were crudely estimated. Dive slates used to record data, were marked along one edge at 5cm intervals; during initial surveys these could be held close to fish to improve estimation of fish size classes.

A pilot study was carried out from March - June 1999. Three sets of fish counts were completed at 10 of the 12 sample sites (n = 30) to improve fish count techniques and size class estimates. From June 1999, each transect was sampled monthly for 20 months (N = 240) until March 2001. Surveys were not done during the month of September in any sample year.

In addition, control transects, of the same size were run parallel to the mangrove transects approximately 10 m seaward of the mangrove fringe. The same recording method was used, and each control transect was sampled 7 times (N = 84).

At two sites (sites 10 & 11) it was, on occasion, too shallow to swim the belt transect (N = 8 of 20 samples). However, the adjacent substrate was compacted sand and counts could be made by walking slowly along the mangrove fringe. A comparison of monthly counts between the two sampling methods showed no significant difference (Kruskal-Wallis one-way ANOVA on ranks $p > 0.05$, Site 10 – $p = 0.73$, Site 11 – $p = 0.44$). Each month fish count sampling was carried out over one or two days, between 7 am and 6 pm. Methods of obtaining physical measurements were described in chapter 3.

4.2.1 Data Analysis

4.2.1.1 Distribution of fish of different size classes

Summary fish family size class and abundance data were tabulated from the field data (Appendix III). Comparisons where made between sample and control sites, and the distribution of the five most abundant family groups presented graphically. Fish size class abundance data was square root transformed and cluster analysis was carried out using a Bray Curtis similarity coefficient and group averages.

4.2.1.2 Effects of physical parameters on fish populations

Normal distribution of residuals, and constant variance tests were not met for a linear regression analysis, therefore fish count values for each sample at each sample site were correlated with physical measurements using a Spearman rank order correlation. Physical variables included: distance from lagoon opening, dissolved oxygen concentration, salinity, pH, depth and flow rates measured 0.5 and 3 m from the mangrove fringe at each site. Correlations were analysed using data from all sample sites, and then again excluding those sites farthest from the lagoon opening, as it was necessary to determine if physical factors were likely to influence fish abundances when investigating correlations between algae biomass, root density and canopy shade (Chapter 5). Furthermore, in doing this, sampling locations for artificial mangrove unit manipulations (Chapter 6) could be identified in areas that were physico-chemically more uniform.

To determine any affect on fish abundance during different phases of the lunar cycle, the total number of fish counted on any particular sample day was apportioned to the nearest part of the lunar cycle (± 3 days). These values were combined and averaged to give mean abundance values for each lunar phase i.e. new moon, 1st quarter, last quarter and full moon.

4.2.1.3 Seasonal variation

Abundance of different size classes of each fish family were plotted for each monthly sample and presented with best fit 5th order polynomials to indicate patterns of seasonal variation. The significance of summer/winter fish abundance fluctuations was analysed by t-test. When data did not conform to normality or equal variance rules, a Mann-Whitney rank sum test was used.

4.3 Results

In total, an estimated 112,808 fish were counted during the 20 monthly surveys at the 12 sample sites. The most abundant fish species was the small pelagic hardhead silverside of the family Atherinidae. This species lives a pelagic existence as a juvenile and adult, and in the lagoon they were often found in large schools of > 1000 individuals. Their behaviour was generally transient, moving in and out of the mangrove fringe, and they appeared to have relatively limited consistent use of the prop root habitat. Therefore, this species was not included in the analysis of juvenile reef fish utilising the mangrove habitat. Of the remaining fish (24,708), 94% belonged

to the families, Gerreidae (mojarras), Haemulidae (grunts), Lutjanidae (snappers), Pomacentridae (damselfish) or Scaridae (parrotfish) (Table 4.1).

In all, 52 species belonging to 22 families were counted. Size class frequencies are shown for the ten most abundant families (Figure 4.1). The Scarids, in particular *Scarus croicensis, Scarus taeniopterus*, and *Sparisoma radians* were most abundant. *Lutjanus apodus* and *L. griseus* accounted for most of the Lutjanids. *Haemulon flavolineatum* and *H. sciurus* contributed most to the Haemulid count, while the Pomacentrids where composed mostly of *Stegastes leucostictus*.

Table 4.1: Juvenile fish family and species abundance and size class data for Pigeon Creek lagoon.

Species/Family	< 5 cm	5 - 10 cm	10 - 15 cm	15 - 20 cm	20 - 30 cm	30 - 40 cm	> 40 cm	Total
Acanthurus coeruleus	2	1	4	0	0	0	0	7
Acanthurus bahianus	5	3	2	0	0	0	0	10
Acanthurus chirurgus	0	0	3	0	0	0	0	3
ACANTHURIDAE	**7**	**4**	**9**	**0**	**0**	**0**	**0**	**20**
Albula vulpes	0	0	0	0	0	0	3	3
ALBULIDAE	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**3**
Atherinomorus stipes	80700	7400	0	0	0	0	0	88100
ATHERINIDAE	**80700**	**7400**	**0**	**0**	**0**	**0**	**0**	**88100**
Strongylura spp.	0	5	31	36	9	0	0	81
BELONIDAE	**0**	**5**	**31**	**36**	**9**	**0**	**0**	**81**
Caranx ruber	3	0	1	4	7	0	1	16
Caranx latus	0	0	12	11	0	0	0	23
CARANGIDAE	**3**	**0**	**13**	**15**	**7**	**0**	**1**	**39**
Negaprion brevirostris	0	0	0	0	0	0	1	1
CARCHARHINIDAE	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**
Chaetodon capistratus	158	53	0	0	0	0	0	211
Chaetodon striatus	1	1	0	0	0	0	0	2
Chaetodon ocellatus	0	3	0	0	0	0	0	3
CHAETODONTIDAE	**159**	**57**	**0**	**0**	**0**	**0**	**0**	**216**
Gerres cinereus & *Eucinostomus spp.*	1397	1673	500	58	10	2	0	3640
GERREIDAE	**1397**	**1673**	**500**	**58**	**10**	**2**	**0**	**3640**
GOBIIDAE	**94**	**2**	**0**	**0**	**0**	**0**	**0**	**96**
Haemulon spp.	670	328	20	0	0	0	0	1018
Haemulon flavolineatum	141	876	680	97	0	0	0	1794
Haemulon sciurus	13	241	945	277	40	0	0	1516
Haemulon parrai	2	15	78	16	2	0	0	113
Haemulon plumieri	0	0	2	0	0	0	0	2
HAEMULIDAE	**826**	**1460**	**1725**	**390**	**42**	**0**	**0**	**4443**
Kyphosus sectatrix	0	0	1	0	0	0	0	1
KYPHOSIDAE	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**

Table 4.1 contd.

Species/Family	< 5 cm	5 - 10 cm	10 - 15 cm	15 - 20 cm	20 - 30 cm	30 - 40 cm	> 40 cm	Total
Halichoeres maculipinna	80	79	0	0	0	0	0	159
Thalassoma bifasciatum	3	20	2	0	0	0	0	25
Halichoeres bivittatus	19	108	12	4	0	0	0	143
LABRIDAE	**102**	**207**	**14**	**4**	**0**	**0**	**0**	**327**
Lutjanus apodus	375	982	2018	1416	213	5	0	5009
Lutjanus griseus	12	81	595	694	201	12	0	1595
Ocyurus chrysurus	7	31	98	25	11	0	0	172
Lutjanus cyanopterus	0	0	1	5	7	0	0	13
Lutjanus mahogoni	5	17	48	4	0	0	0	74
LUTJANIDAE	**399**	**1111**	**2760**	**2144**	**432**	**17**	**0**	**6863**
Pseudupeneus maculatus	1	11	10	1	0	0	0	23
Mulloidichthys martinicus	0	24	153	73	7	0	0	257
MULLIDAE	**1**	**35**	**163**	**74**	**7**	**0**	**0**	**280**
Lactophrys triqueter	0	0	1	0	4	0	0	5
Lactophrys polygonia	0	0	0	0	1	0	0	1
OSTRACIIDAE	**0**	**0**	**1**	**0**	**5**	**0**	**0**	**6**
Pomacanthus arcuatus	0	0	2	1	0	0	0	3
Pomacanthus paru	0	0	6	4	0	0	0	10
POMACANTHIDAE	**0**	**0**	**8**	**5**	**0**	**0**	**0**	**13**
Stegastes leucostictus	332	304	1	0	0	0	0	637
Abudefduf saxatilis	122	37	1	0	0	0	0	160
POMACENTRIDAE	**454**	**341**	**2**	**0**	**0**	**0**	**0**	**797**
Scarus spp. Sparisoma spp.	3952	2459	46	11	0	0	0	6468
Sparisoma radians	62	226	273	33	0	0	0	594
Sparisoma viride	12	7	20	3	0	0	0	42
Scarus guacamaia	7	12	13	32	11	1	1	77
Scarus vetula	0	0	2	3	1	0	0	6
Scarus taeniopterus	0	0	0	2	0	0	0	2
Scarus croicensis	0	1	2	6	0	0	0	9
Scarus coeruleus	0	1	4	2	0	0	0	7
Sparisoma aurofrenatum	0	0	0	1	0	0	0	1
SCARIDAE	**4033**	**2706**	**360**	**93**	**12**	**1**	**1**	**7206**
Epinephelus striatus	0	2	3	9	3	0	0	17
SERRANIDAE	**0**	**2**	**3**	**9**	**3**	**0**	**0**	**17**
Calamus bajonado	0	1	1	0	0	0	0	2
SPARIDAE	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**2**
Sphyraena barracuda	17	38	61	84	78	48	34	360
SPHYRAENIDAE	**17**	**38**	**61**	**84**	**78**	**48**	**34**	**360**
Sphoeroides testudineus	2	2	11	173	100	3	0	291
Sphoeroides spengleri	0	0	2	1	0	0	0	3
Diodon hystrix	0	0	0	0	2	0	1	3
TETRAODONTIDAE	**2**	**2**	**13**	**174**	**102**	**3**	**1**	**297**
							TOTAL	**112808**

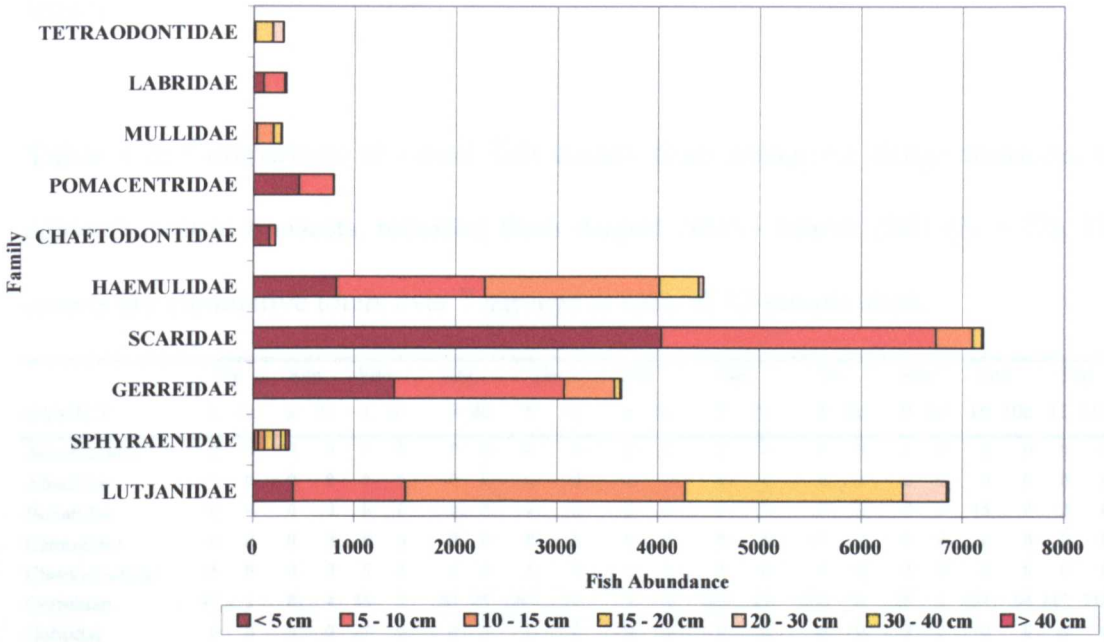


Figure 4.1: Abundance and size class frequencies of ten most abundant fish families, counted during visual surveys in Pigeon Creek lagoon.

The great barracuda *Sphyraena barracuda* was the only species present in all size classes. In contrast, the Pomacentrids, *Stegastes leucostictus* and *Abudefduf saxatilis* whose maximum lengths are approximately 10cm and 18cm respectively were only found in size classes ≤ 10cm. The majority of Scarids were < 10cm in length with only small numbers of *Scarus guacamaia* and *Sparisoma radians* present in larger size classes. Lutjanids and Haemulids were recorded in five size classes. Lutjanids were most abundant at lengths between 10 and 20 cm. Smaller size classes may have been more elusive as smaller individuals had a tendency to move around more amongst the mangrove prop roots, compared to larger juveniles that remained quite stationary in large resting schools. Haemulids were on average smaller than the

Lutjanids, having fewer individuals larger than 20 cm. Most Gerreids were ≤ 10cm in length.

Table 4.2: Comparison of visual fish counts from mangrove fringe transects and adjacent control transects, recorded from August 2000 – March 2001 (N = 72). Fish counts are cumulative totals over 7 surveys at each of 12 sample sites.

	Site		Site		Site		Site		Site		Site		Site		Site		Site		Site		Site		Site	
FAMILY	**1**	**1c**	**2**	**2c**	**3**	**3c**	**4**	**4c**	**5**	**5c**	**6**	**6c**	**7**	**7c**	**8**	**8c**	**9**	**9c**	**10**	**10c**	**11**	**11c**	**12**	**12c**
Acanthuridae	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2	0	1	0	0	0	0	0	0	0
Albulidae	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Belonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	2	0	0	0
Carangidae	0	0	0	0	0	0	0	0	0	0	0	0	0	6	17	4	6	0	0	0	0	0	0	0
Chaetodontidae	15	0	0	0	5	0	2	0	4	0	4	0	3	0	9	0	2	0	0	0	0	0	7	0
Gerreidae	47	1	8	4	46	5	87	24	67	15	5	0	146	22	190	73	38	5	164	64	117	215	209	8
Gobiidae	0	0	3	0	27	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0
Haemulidae	10	0	14	0	23	0	215	0	52	0	27	0	456	0	618	0	56	0	2	2	0	0	173	3
Labridae	7	0	0	0	19	1	4	1	6	0	28	1	37	1	29	0	0	0	0	0	0	0	2	0
Lutjanidae	82	10	42	0	80	2	476	0	78	0	134	1	590	6	515	0	34	0	9	0	9	1	58	0
Mullidae	4	0	2	0	1	1	43	0	27	8	9	0	71	2	18	0	0	0	0	0	0	0	0	0
Ostraciidae	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0
Pomacentridae	29	0	1	0	14	0	41	0	10	0	49	0	71	0	65	0	3	0	0	0	0	0	0	0
Scaridae	545	23	81	0	532	7	222	9	199	5	586	11	260	42	70	4	97	13	0	0	2	0	42	1
Serranidae	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0
Sparidae	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
Sphyraenidae	4	4	13	2	23	22	11	1	9	9	3	3	16	1	11	1	2	4	1	0	13	1	5	0
Tetraodontidae	2	0	3	0	10	0	45	1	1	0	1	0	3	0	1	0	3	0	0	0	0	0	2	0
TOTAL	745	38	167	7	780	38	1146	36	453	38	848	16	1658	80	1549	82	251	22	191	67	143	217	498	12

Table 4.2 shows the fish families present at each sample site from August 2000 to March 2001 excluding the Atherinidae, and compares those counted in the sample transects to the controls. In the control transects a total 653 fish were counted compared to 8,429 over the same time period in the mangrove fringe. Control transects contained a variety of habitat attributes at various densities including seagrass, macroalgae and sand/mud cover (Table 4.3).

Table 4.3: Benthic composition of control transects adjacent to sample sites 1 – 12 in Pigeon Creek lagoon.

Site	Depth (Metres)	% Cover of Seagrass	% Cover of Macroalgae	% Cover of Sand/Mud
1c	0.9	70	25	5
2c	1.2	50	20	30
3c	0.9	30	40	30
4c	1.5	50	25	25
5c	0.6	70	10	20
6c	0.5	25	5	70
7c	1.5	45	15	40
8c	0.6	5	2	93
9c	0.3	15	5	80
10c	0.3	2	0	98
11c	0.3	2	0	98
12c	0.9	40	20	40

These results show that even in such close proximity to the mangrove fringe, fish have a preference for the shelter of the mangrove roots. At all sites except 11, the mangrove root habitat had a far greater abundance of juvenile fish. The exceptional values recorded at site 11 can be attributed to the high numbers of Gerreids, found over the bare sand/mud areas adjacent to the site. Generally, areas outside the mangrove fringe were dominated by Gerreids (66.8% relative abundance), Scarids (17.6%), Sphyraenids (7.4%), Lutjanids (3%), Mullids (1.7%), Carangids (1.5%), Haemulids (0.8%), Labrids (0.6%), Ostraciids (0.5%) and Tetraodontids (0.2%).

The Gerreids and Sphyraenids were common throughout the lagoon over sand/mud habitat, as were Scarids in the seagrass habitat. In addition, the composition of fish communities in the mangrove fringe over the seven months of site and control transect sampling showed greater diversity in the mangrove fringe, which supported 43 species belonging to 18 families compared to 17 species from 10 families in adjacent habitats. Of the species counted in the control transects only two, (*Caranx bartholomaei* and *Lactophrys triqueter*) were not found in the mangrove root habitat.

4.3.1 Site comparisons

The majority of fish species (94%) utilising mangrove prop root habitat in Pigeon Creek were represented by five family groups composed of 21 species. For the purposes of this analysis those families with little representation are not considered further. The data indicates anomalies in the distribution of juvenile fish within the lagoon. There was a shift in abundance from Scarids in the east/west arm of the lagoon to Gerreids in the upper portion of the north/south arm (Figure 4.2). Haemulids and Lutjanids were most abundant, from the channel opening to the mid north/south arm of the lagoon (Sites 4 – 9), except at site 5 which was dominated by Scarids and Gerreids, and site 6 where Scarids and Lutjanids were most numerous.

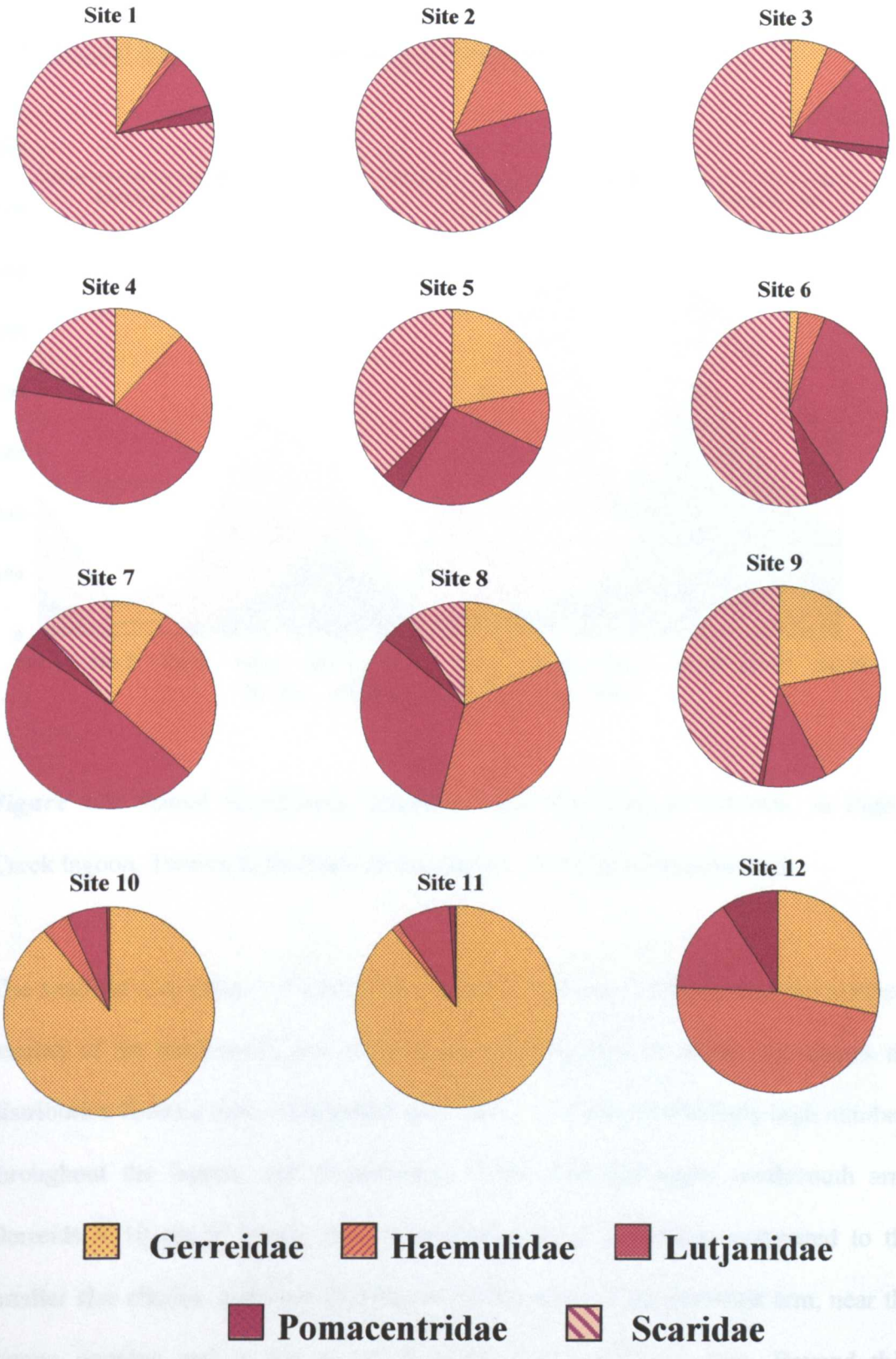


Figure 4.2: Relative abundance of 5 dominant fish families at twelve sample sites in Pigeon Creek Lagoon

4.3.2 Spatial distribution and abundance of juvenile fish families

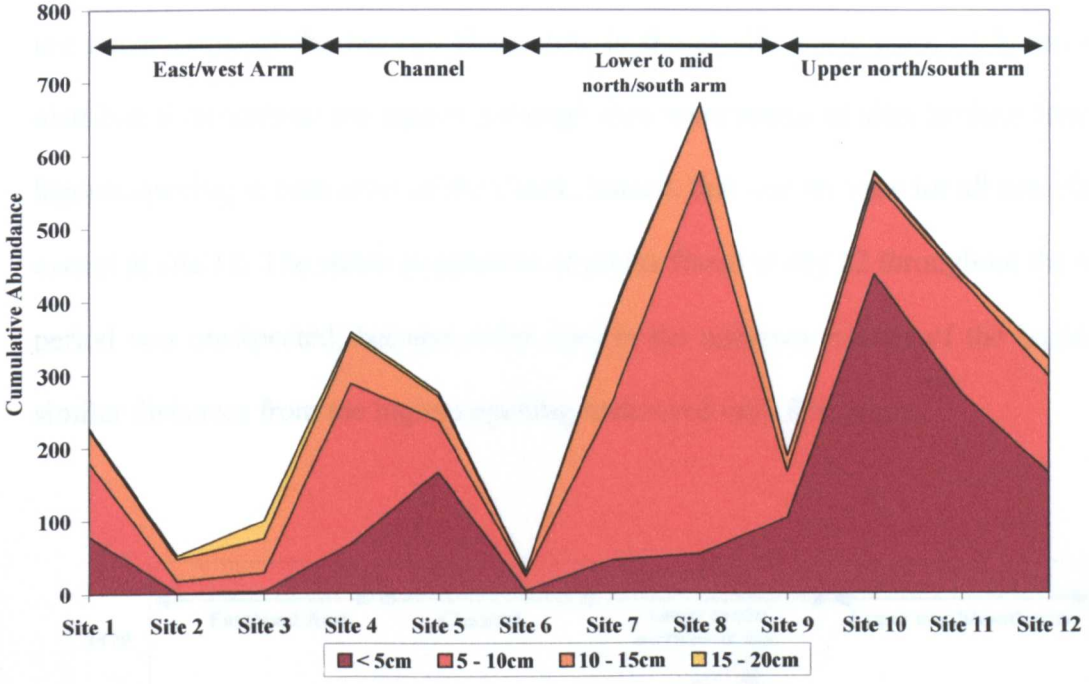


Figure 4.3: Spatial distribution, abundance and size class of Gerreids, in Pigeon Creek lagoon. Twelve individuals of size class > 20 cm have been omitted.

The smallest size class (< 5 cm) of the Gerreids were most abundant in the northern reaches of the north/south arm of the lagoon (Figure 4.3). In larger size classes the distribution became more widespread with fish (5 – 10 cm) in relatively high numbers throughout the lagoon, but in particular in the mid and upper north/south arm. Gerreids > 10 cm in length were significantly fewer in number compared to the smaller size classes, and their distribution tended to be in the east/west arm, near the lagoon opening and as far as site 8 in the mid north/south arm. Beyond this, abundance of larger Gerreids reduced significantly.

Fish in the family Haemulidae showed three main peaks of abundance (Figure 4.4), at site 4 near the lagoon opening, sites 7 and 8 in the mid north/south arm and site 12 in the upper north of the lagoon. Haemulids in the smallest size class (< 5 cm) were distributed throughout the lagoon although they were scarce at sites furthest from the lagoon opening in both arms of the Creek. Indeed, this was the case for all size classes except at site 12. The stable population of grunts found at site 12 throughout the study period was unexpected, because other sites in the northern reaches of the lagoon, at similar distances from the lagoon opening harboured very few grunts.

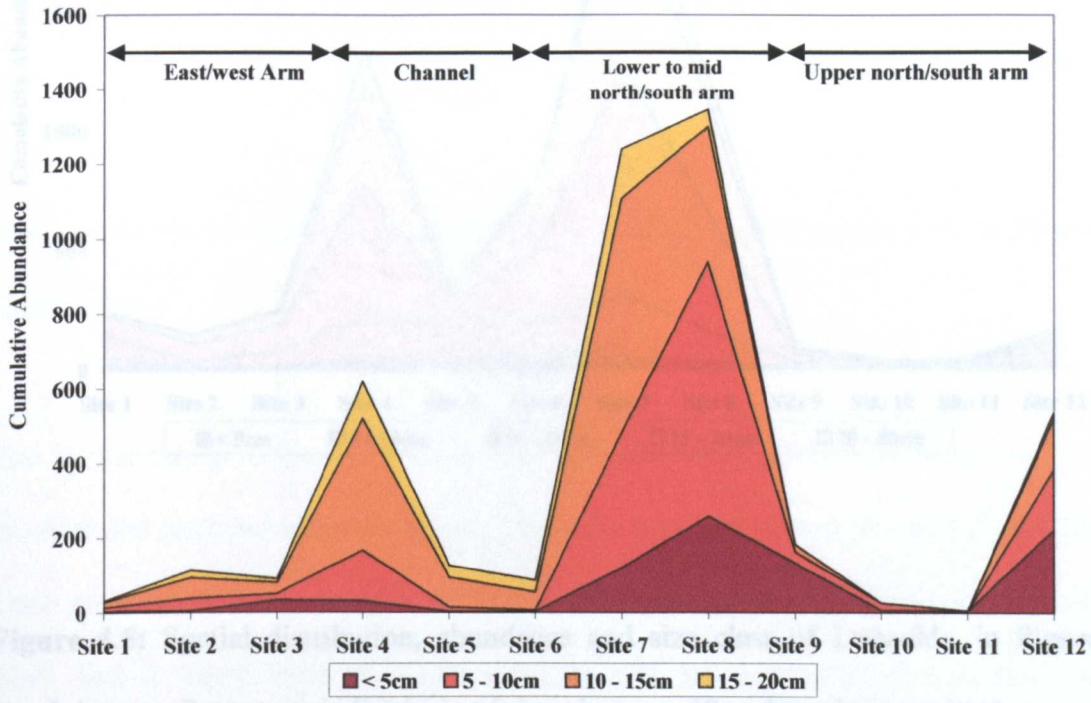


Figure 4.4: Spatial distribution, abundance and size class of Haemulids, in Pigeon Creek lagoon.

Lutjanid abundance peaked at sites 4 and 7 (Figure 4.5), and they were most prolific from the lagoon opening area as far north as site 8 in the mid north/south arm. Like

the Haemulids, the numbers of Lutjanids dropped off significantly at both ends of each lagoon arm, but in particular further north of site 8. In contrast to the Haemulids, Lutjanids did not increase in abundance to the same extent at site 12. Smaller size classes, < 10 cm were distributed throughout the lagoon and were evident at all sample sites.

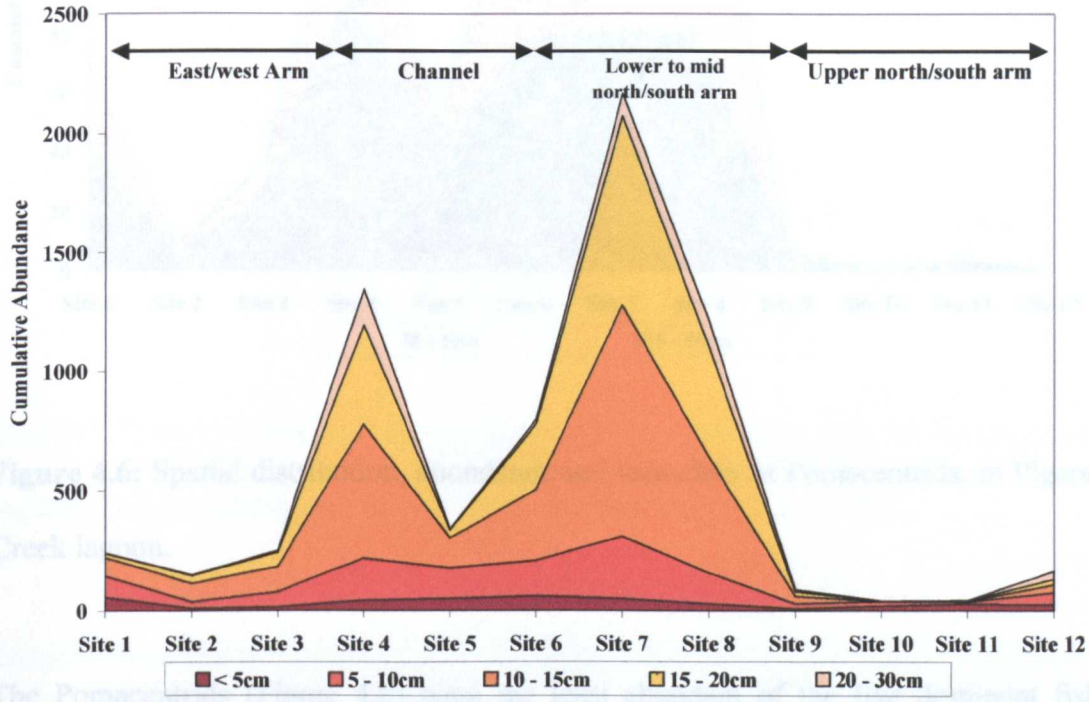


Figure 4.5: Spatial distribution, abundance and size class of Lutjanids, in Pigeon Creek lagoon. Seventeen individuals of size classes > 30cm have been omitted.

Larger size classes between 10 and 30 cm were found in greatest numbers between sites 4 and 8 with mature (20 – 30 cm) fish located mostly at site 4 close to the lagoon opening. Only seventeen fish > 30 cm were counted, most of which were at sites 4 and 12.

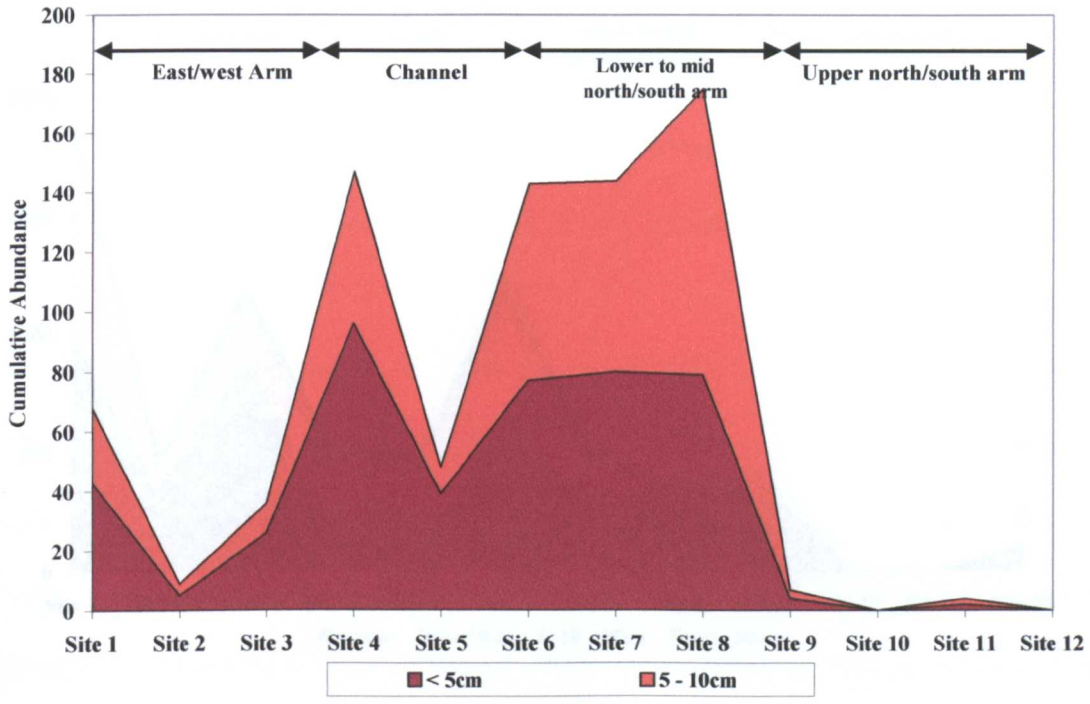


Figure 4.6: Spatial distribution, abundance and size class of Pomacentrids, in Pigeon Creek lagoon.

The Pomacentrids (Figure 4.6) were the least abundant of the five dominant fish families and included only two species *Stegastes leucostictus* and *Abudefduf saxatilis.* Their greatest numbers were found close to the lagoon opening as far north as site 8. They had a fairly wide distribution throughout the east/west arm to the mid north/south arm but over the study period were hardly present in the upper northern reaches of the lagoon.

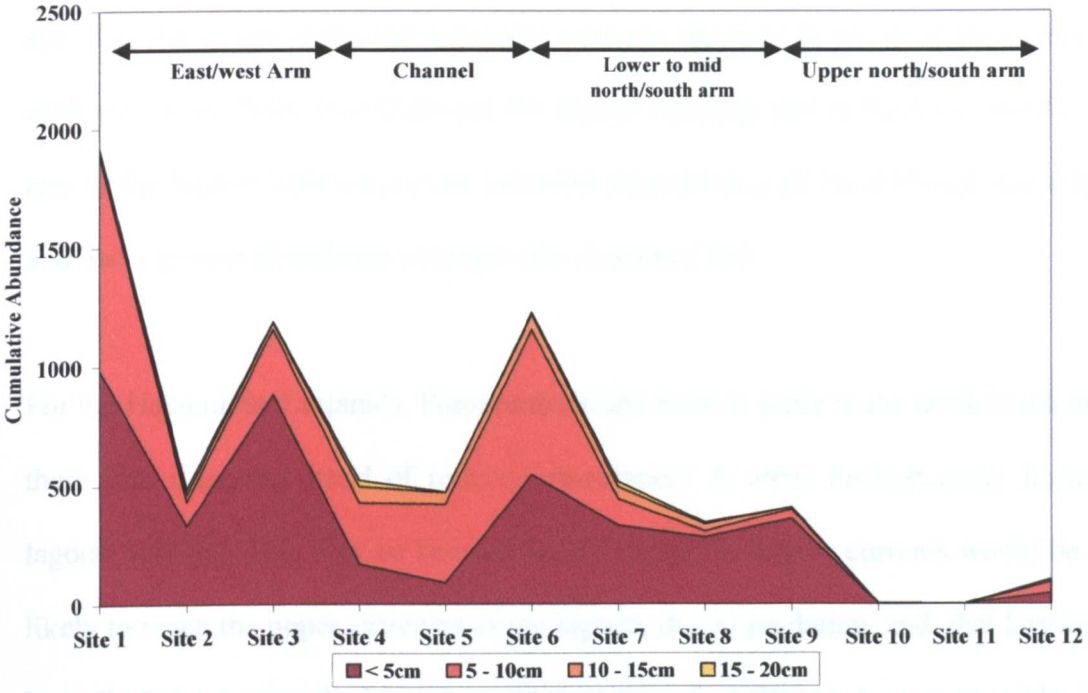


Figure 4.7: Spatial distribution, abundance and size class of Scarids, in Pigeon Creek lagoon. Thirteen individuals of size classes > 20cm have been omitted.

Scarids dominated the east/west arm of Pigeon Creek, particularly site 1 (Figure 4.7). Distribution was skewed throughout the range of the lagoon from the far reaches of the east/west arm through the channel area as far north as site 9. After site 9 Scarids were not recorded at sites 10 or 11 and were few at site 12. The small number of Scarids from the largest size class were found at site 4 close to the lagoon opening. Only thirteen Scarids > 20 cm were counted, and these were recorded at sites 1, 3, 4 and 7, but are not represented in Figure 4.7.

The dendrogram (Figure 4.8) clusters sites by the size class of fish present at each site. The bar graph shows the similarity between the sites in terms of abundances in each size class. Sites located around the lagoon opening, and in the lower north/south arm of the lagoon harboured more juveniles representing all the different size classes and had a greater abundance of larger size classes of fish.

For the Haemulids, Lutjanids, Pomacentrids and Scarids (only in the north/south arm), there was a general trend of reduced abundances in areas furthest away from the lagoon opening. This may be because larvae carried in lagoon currents would be less likely to reach the upper extremes of the lagoon, due to predation, and, that larvae and juvenile fish entering the lagoon would tend to seek shelter as soon as possible. This distribution may also indicate a lack of movement at a lagoon wide spatial scale following settlement in suitable prop root habitat.

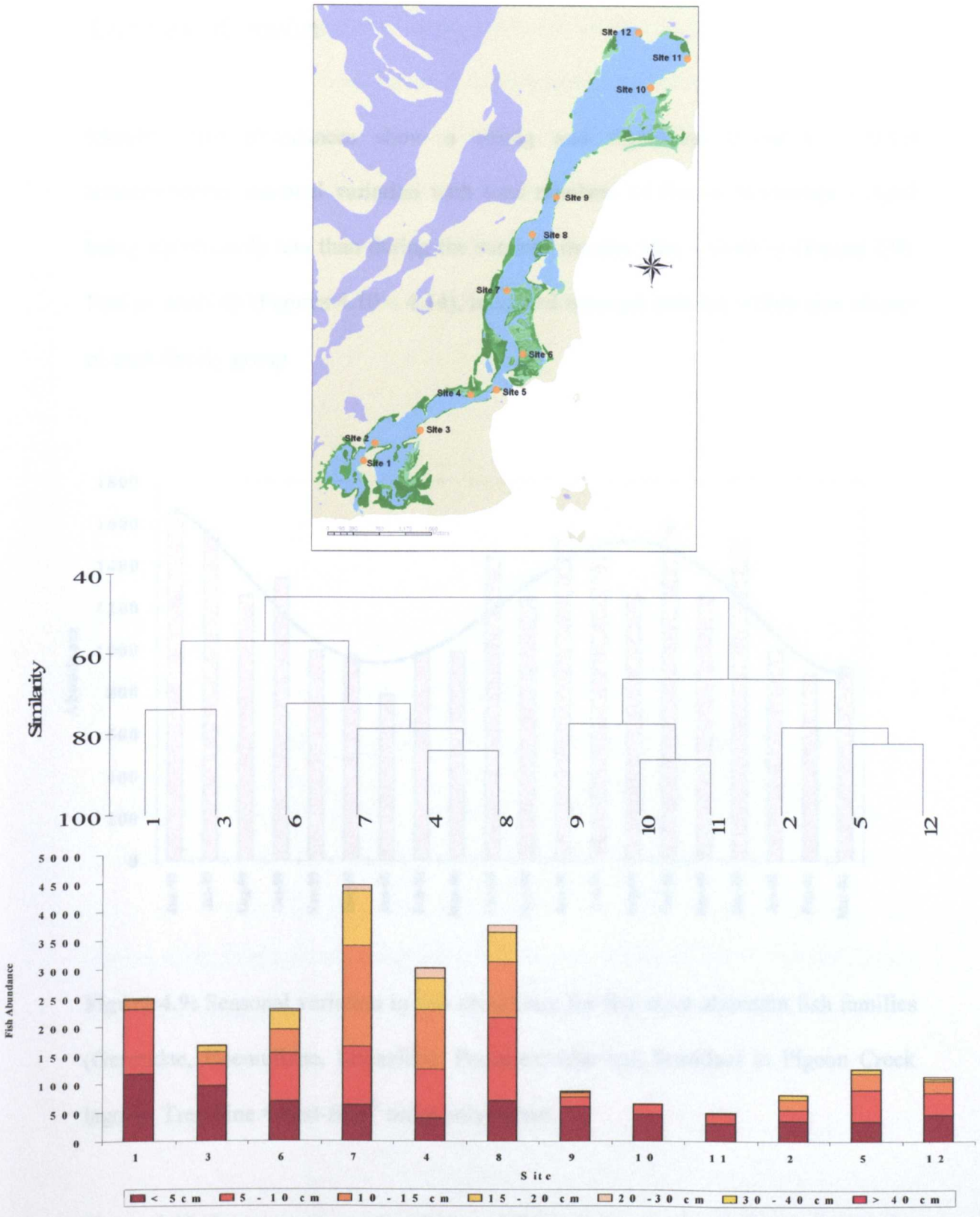


Figure 4.8: Map of sample sites, with Bray Curtis similarity cluster on juvenile fish size classes and bar graph representing the composition of each cluster group, in Pigeon Creek lagoon.

4.3.3 Seasonal variation

Monthly fish abundances show a strong and significant (t-test $P < 0.05$) summer/winter seasonal variation with total numbers of fish in November – April being significantly less than during the summer months May – October (Figure 4.9). Further analysis (Figures 4.10 – 4.14), indicated seasonal patterns within size classes of each family group.

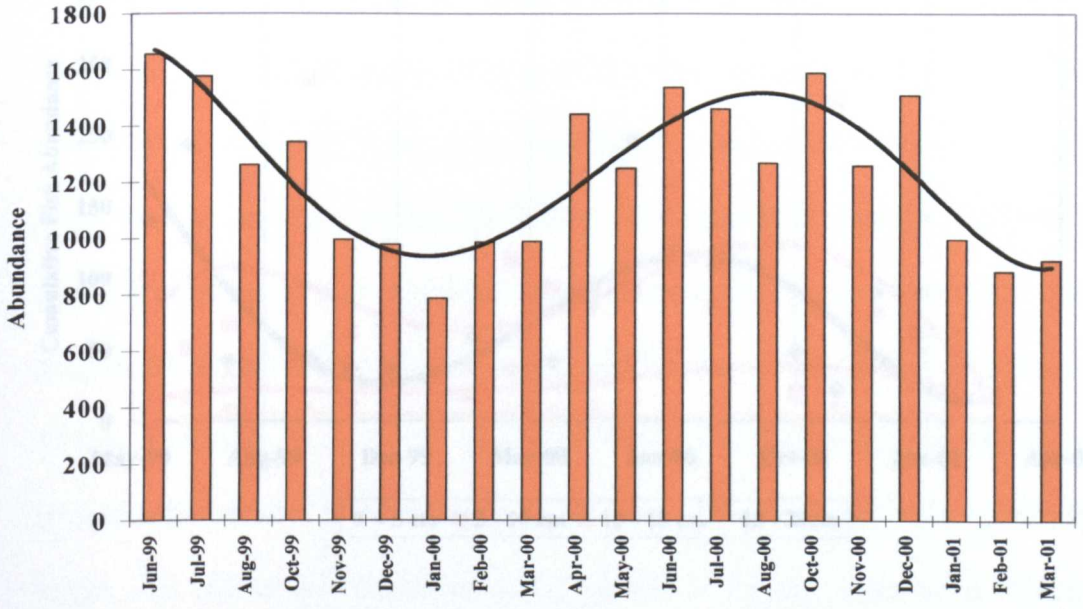


Figure 4.9: Seasonal variation in fish abundance for five most abundant fish families (Gerreidae, Haemulidae, Lutjanidae, Pomacentridae and Scaridae) in Pigeon Creek lagoon. Trendline = best-fit 5th order polynomial.

Figure 4.10 shows no seasonal variation of fish numbers in the mangrove habitat for fish > 10cm in length. However Gerreids of the size class < 5 cm show significantly fewer fish recorded in winter than in summer (Mann-Whitney sum rank test $p < 0.05$, Table 4.4). Gerreids in the size class 5 – 10 cm showed similar, although not

significant ($p > 0.05$) patterns of variation, but peaked in numbers later than the smaller size class over both summers of sampling. It appears that both smaller size classes show summer recruitment to the mangrove habitat and possibly a seasonal migration to other lagoon habitats. Gerreids in larger size classes seem to utilise the mangrove habitat less consistently and this would perhaps indicate an ontogenetic shift in fish > 10cm to preferred open water habitats.

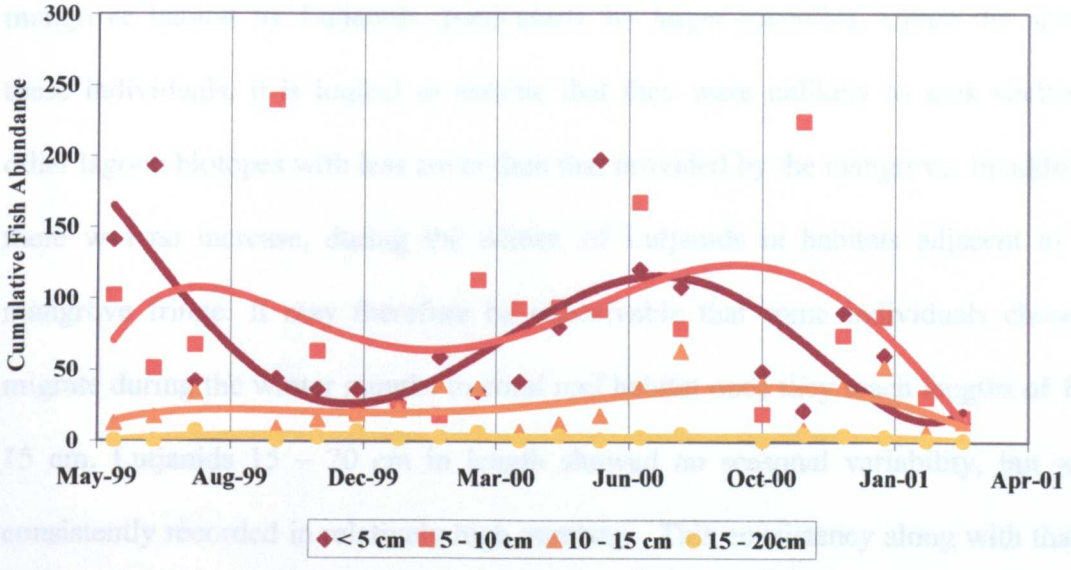


Figure 4.10: Seasonal variability of different size classes of fish within the family Gerreidae. Monthly abundance of fish in each size class is show as a scatter plot, and seasonal variations for each size class are represented by best-fit 5th order polynomials.

Haemulids (Figure 4.11) showed no seasonal recruitment by the smallest individuals to mangrove habitat. Haemulids of the size classes 5 – 10 cm and 10 – 15 cm showed seasonal fluctuations, but only the 5 – 10 cm size class showed significant variation. For Lutjanids (Figure 4.12), there were significant seasonal fluctuations for fish 5 – 10 cm and 10 – 15 cm in length (Table 4.4). For 5 – 10 cm juveniles this may have indicated a seasonal recruitment to mangrove habitat. For 10 – 15 cm fish this may indicate an ontogenetic shift to other lagoon habitats, but perhaps more likely, recruitment to the coral reef. Recent research has indicated a high dependency on mangrove habitat by Lutjanids, particularly by larger juveniles. Given the size of these individuals, it is logical to assume that they were unlikely to seek shelter in other lagoon biotopes with less cover than that provided by the mangrove. In addition, there was no increase, during the winter, of Lutjanids in habitats adjacent to the mangrove fringe. It may therefore be conceivable that some individuals chose to migrate during the winter months to coral reef habitat once they reach lengths of 10 – 15 cm. Lutjanids 15 – 20 cm in length showed no seasonal variability, but were consistently recorded in relatively high numbers. This consistency along with that of larger size classes of Haemulids and Lutjanids > 20 cm suggested a diffuse and continuous migration of larger individuals to reef habitats. For those in the largest size classes there may have been a small resident population of adult fish in the lagoon.

The smallest size classes of both Pomacentrids and Scarids (Figures 4.13 and 4.14) showed seasonal recruitment to the mangrove habitat with peaks in abundance during the summer months. Larger size classes of Scarids were low in abundance, but counts were consistent throughout the sampling period. Given that most of the large size class Scarids were bucktooth parrotfish (*Sparisoma radians*) which generally live in

seagrass habitat, it is likely that these larger fish were permanent residents in the lagoon. Rainbow parrotfish (*Scarus guacamaia)* were also evident in the larger size classes (15 – 20 cm) but are commonly found in coral reef habitat as adults, consequently, it appears that recruitment to the reef habitat may be in individual or small group migrations. *Scarus taeniopterus* and *Scarus croicensis* were rarely seen in size classes > 10cm.

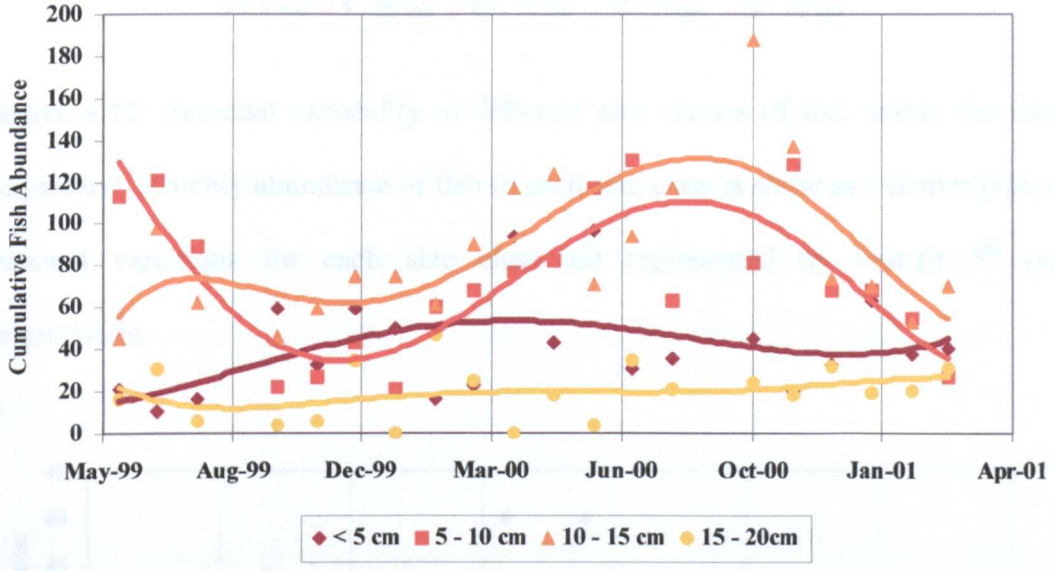


Figure 4.11: Seasonal variability of different size classes of fish within the family Haemulidae. Monthly abundance of fish in each size class is show as a scatter plot, and seasonal variations for each size class are represented by best-fit 5th order polynomials.

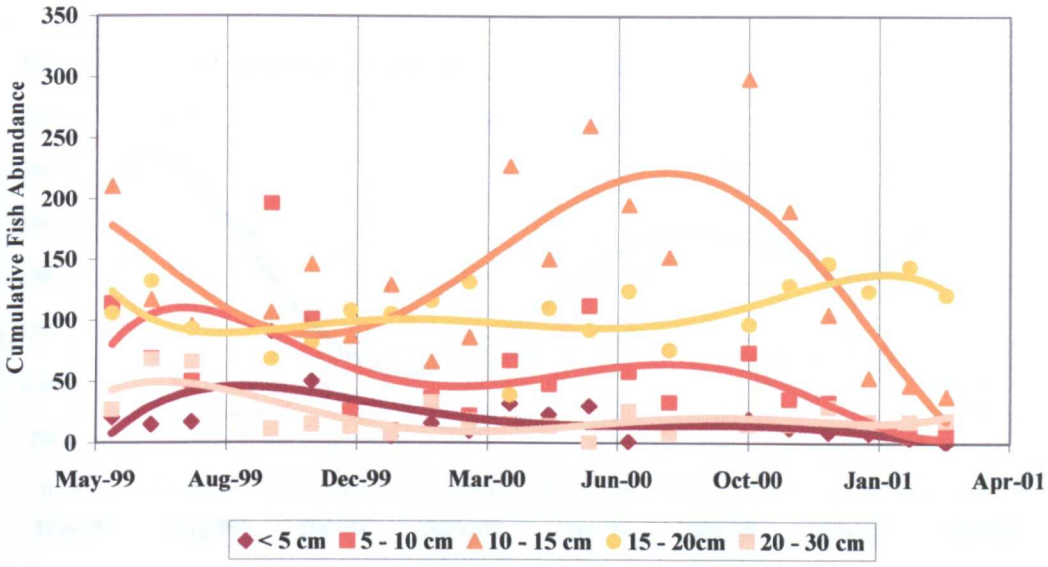


Figure 4.12: Seasonal variability of different size classes of fish within the family Lutjanidae. Monthly abundance of fish in each size class is show as a scatter plot, and seasonal variations for each size class are represented by best-fit 5th order polynomials.

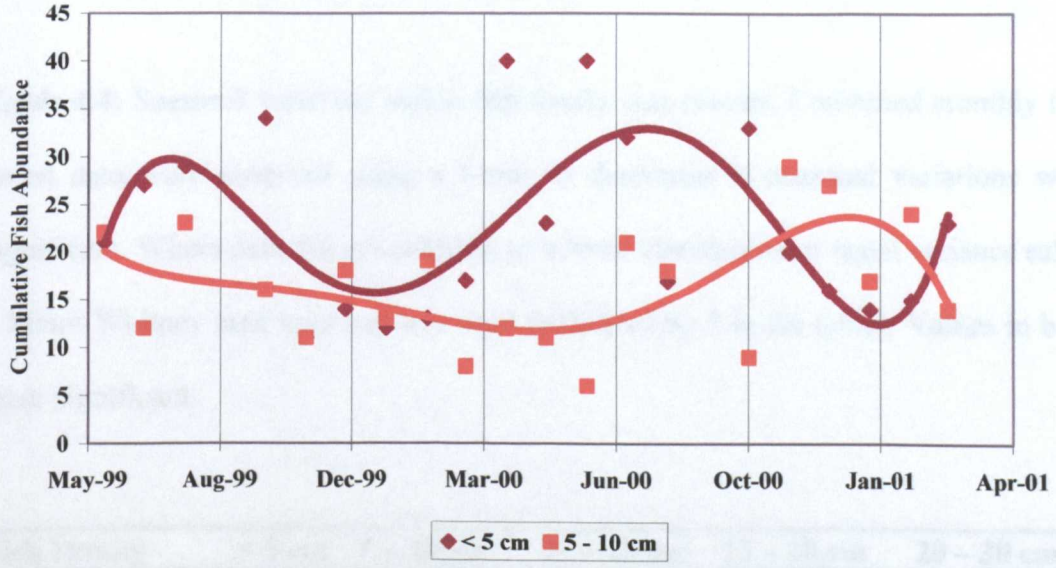


Figure 4.13: Seasonal variability of different size classes of fish within the family Pomacentridae. Monthly abundance of fish in each size class is show as a scatter plot, and seasonal variations for each size class are represented by best-fit 5th order polynomials.

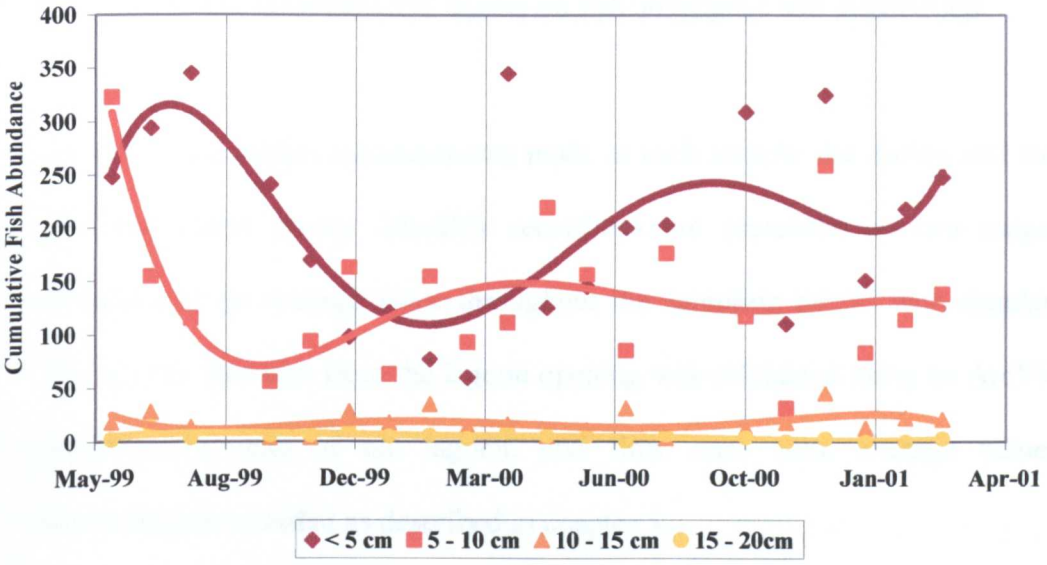


Figure 4.14: Seasonal variability of different size classes of fish within the family Scaridae. Monthly abundance of fish in each size class are show as a scatter plot, and seasonal variations for each size class are represented by best fit 5th order polynomials.

Table 4.4: Seasonal variation within fish family size classes. Combined monthly fish count data were analysed using a t-test, to determine if seasonal variations were significant. Where data did not conform to normal distribution or equal variance rules, a Mann-Whitney rank sum test was used (indicated by * in the table). Values in bold were significant.

Fish Family	< 5 cm	5 – 10cm	10 – 15 cm	15 – 20 cm	20 – 30 cm
Gerreidae	**0.003***	0.281	0.732	0.422	-
Haemulidae	0.804	**0.036**	0.406	0.563	0.732*
Lutjanidae	0.271*	**0.006***	**0.029**	0.276	0.909*
Pomacentridae	**0.007**	0.478	-	-	-
Scaridae	0.148	0.250	0.150	0.639	-

4.3.4 The influence of physical factors on fish abundance and distribution.

Table 4.5 summarises measurements made at each sample site during and following each fish count survey. Monthly recordings are presented in data ranges. Fish abundance is an average value throughout the sampling period with standard error (SE) shown. Distance from the lagoon opening was calculated using an ArcView GIS georeferenced map of the lagoon, and flow rates were average values from measurements recorded as described in chapter 3.

Table 4.5: Summary of physical data recorded at each sample site during and after each fish count survey.

Site	Distance from lagoon opening (m^{-1})	Depth Range (cm^{-1})	Salinity Range $^{0}/_{00}$	Dissolved Oxygen Range ($mg\ l^{-1}$)	PH Range	Average Flow Rate ($m\ sec^{-1}$)		Average Fish Abundance ($100\ m^{-2}$)	SE
						0.5 m	3 m		
1	2350	26.8 - 72.2	33 - 42	2.6 - 6.5	7.8 – 8.5	0.04	0.04	129	14.4
2	2138	58.6 - 106	31 - 40	2.6 – 7.4	8 – 8.5	0.08	0.09	44	10.6
3	1532	45.5 - 90.3	30 - 39	2.2 – 6.6	8 – 8.5	0.03	0.04	94	14.7
4	570	33 - 83	34 - 40	4 – 7.2	8 – 8.5	0.27	0.34	171	17.0
5	151	15 - 71.6	33 - 40	2.6 – 5.6	7.9 – 8.4	0.30	0.27	71	11.9
6	550	29.5 - 85.8	33 - 40	4 – 6.6	8 – 8.4	0.19	0.40	121	15.3
7	1479	43.3 - 83.6	30 - 41	3.4 – 6.5	8 – 8.4	0.14	0.34	236	17.4
8	2100	41.3 - 71.8	30 - 40	3.8 – 6.6	7.9 – 8.4	0.11	0.26	199	12.5
9	2975	47 - 81.8	31 - 43	3 – 6.4	8 – 8.4	0.07	0.09	48	7.5
10	5200	6.3 - 44.5	33 - 45	3 – 6.2	8 – 8.4	0.01	0.01	35	7.0
11	6012	11.6 - 50	34 - 45	3 – 6.4	8 – 8.4	0.01	0.01	26	5.3
12	5760	56.1 - 93.5	33 - 47	3 – 5.6	8 – 8.4	0.01	0.01	59	6.0

pH values varied little during the study period and were therefore unlikely to influence the distribution of fish in the lagoon. There was no correlation between fish abundance and dissolved oxygen concentration (Spearman Rank Order Correlation p

> 0.05). When considering data from all twelve sample sites, fish abundance fell significantly ($p < 0.01$) with distance from the lagoon opening (Figure 4.15), and an increase in salinity (Figure 4.16). Fish abundance correlated positively with an increase in tidal flow ($p < 0.001$). Juvenile fish numbers tended to increase with increased water depth, but this trend was not significant when disregarding the anomalously shallow sites 10 and 11.

The relationship between fish abundance and distance from the lagoon opening, became non-significant when analysing data from sites 1 – 8 only. This was also the case for salinity. Fish abundance data from sites in the northern reaches of the north/south arm clearly influenced the relationship between the parameters, salinity and distance. Given the geographical distance between site 9 and sites 10, 11, and 12, significant correlations determined using all twelve sample sites appeared to be unfounded. Considering the distance at which each site is located relative to the lagoon opening, I concluded that distance from the lagoon opening is not a limiting factor for fish distribution in Pigeon Creek until a distance between 2350 and 2975 m is reached. These are the distances at which the farthest away sites from the lagoon opening i.e. sites 1 and 9 are located before fish abundances significantly drop.

Tidal flow rates were measured 0.5 and 3 m from the mangrove fringe (Figure 4.17 and 4.18). Considering data from all sample sites, the correlation between flow rates at both 0.5 and 3 m and an increase in fish abundance was highly significant (Spearman Rank Order Correlation $p < 0.001$). For flow rate measurements recorded 0.5 m from the mangrove fringe, the greatest abundance of juvenile fish was found in areas with flow rates of approximately 0.15 m sec^{-1}. For flow measurements 3 m

from the fringe, the greatest abundance of fish were found at flow rates of approximately 0.35 m sec^{-1} (Figure 4.18). The relationship between flow rates at 0.5 m became non-significant when analysing data only from sites 1 – 8, but a significant relationship remained for the 3 m flow rate samples. This indicated that a greater tidal flow may influence the abundance of juveniles utilising a particular area of mangrove habitat, perhaps as a result of increased larval supply.

A comparison of abundances of all fish species counted over the sample period at different phases of the lunar cycle showed no significant differences (Figure 4.19). Therefore, mangrove habitat fish populations appeared to be uninfluenced by the lunar phase.

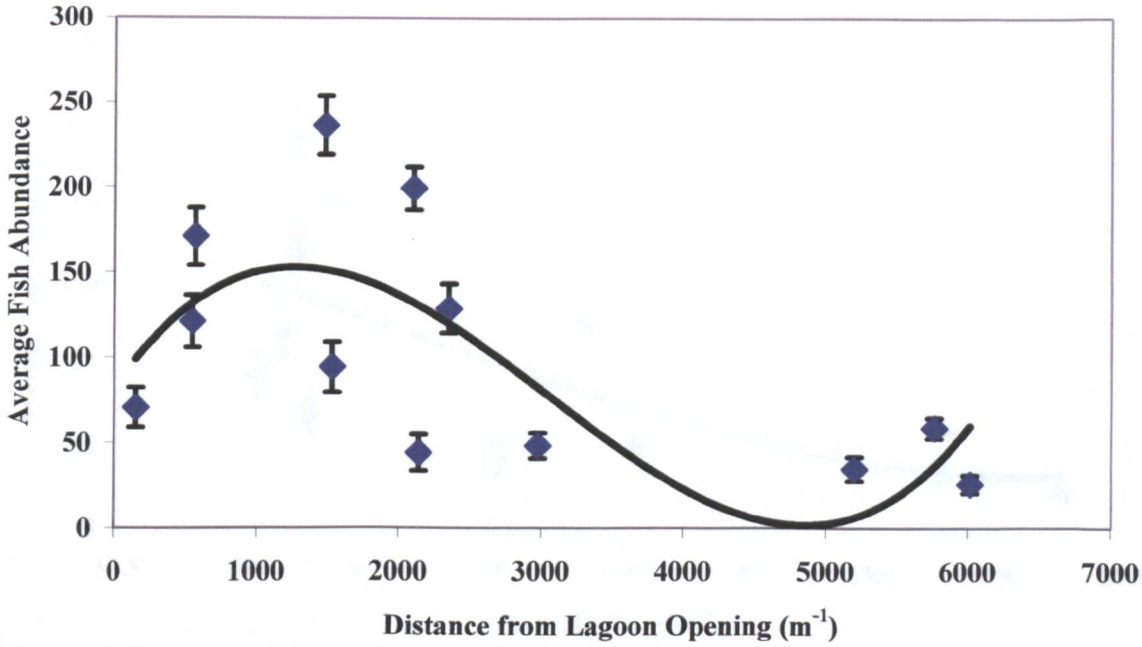


Figure 4.15: The relationship between fish abundance and distance from the lagoon opening. Using a Spearman Rank Order Correlation, this relationship was shown to be significant ($p < 0.01$) when considering fish abundance data from all twelve sample sites. Recalculation using data from sites 1 – 8 showed no significant relationship. (Error Bars ± SE)

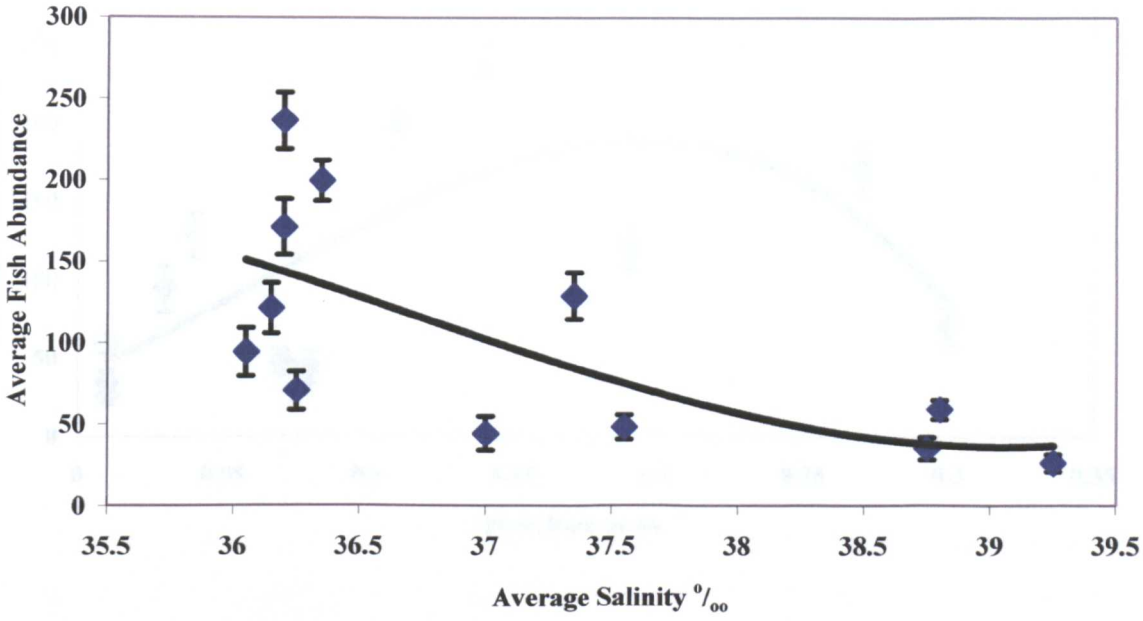


Figure 4.16: The relationship between fish abundance and salinity in Pigeon Creek lagoon. Using a Spearman Rank Order Correlation, this relationship was shown to be significant ($p < 0.01$) when considering fish abundance data from all twelve sample sites. Recalculation using data from sites 1 – 8 showed no significant relationship. (Error Bars ± SE)

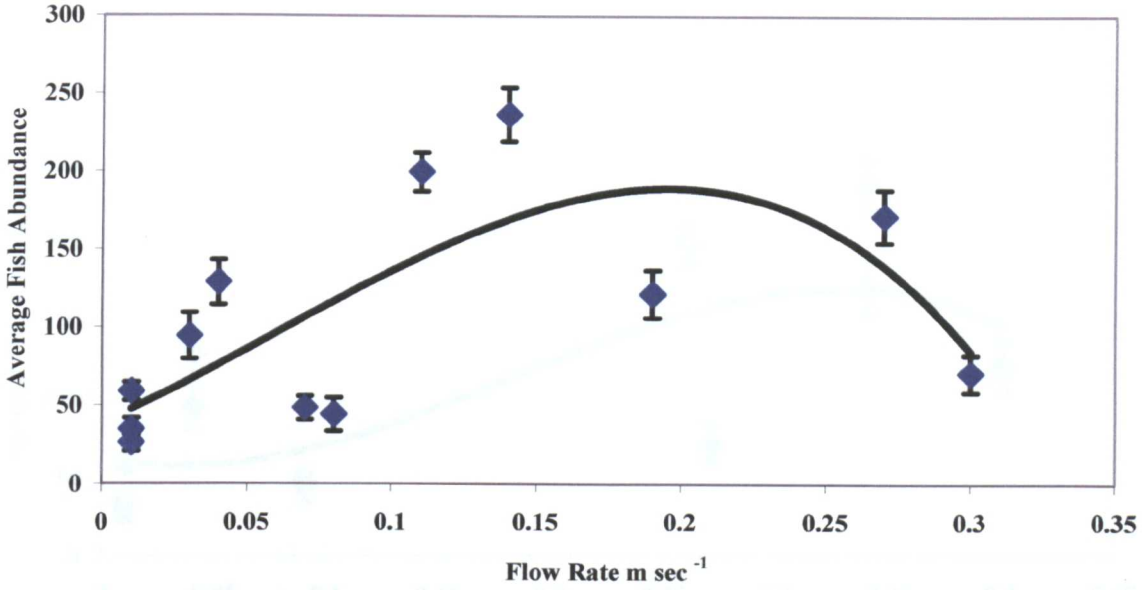


Figure 4.17: Best fit polynomial showing the relationship between fish abundance and flow rate measured 0.5 m from the mangrove fringe. Using a Spearman Rank Order Correlation, this relationship was shown to be highly significant ($p < 0.001$) when considering fish abundance data from all twelve sample sites. Recalculation using data from sites 1 – 8 showed no significant relationship. (Error Bars ± SE)

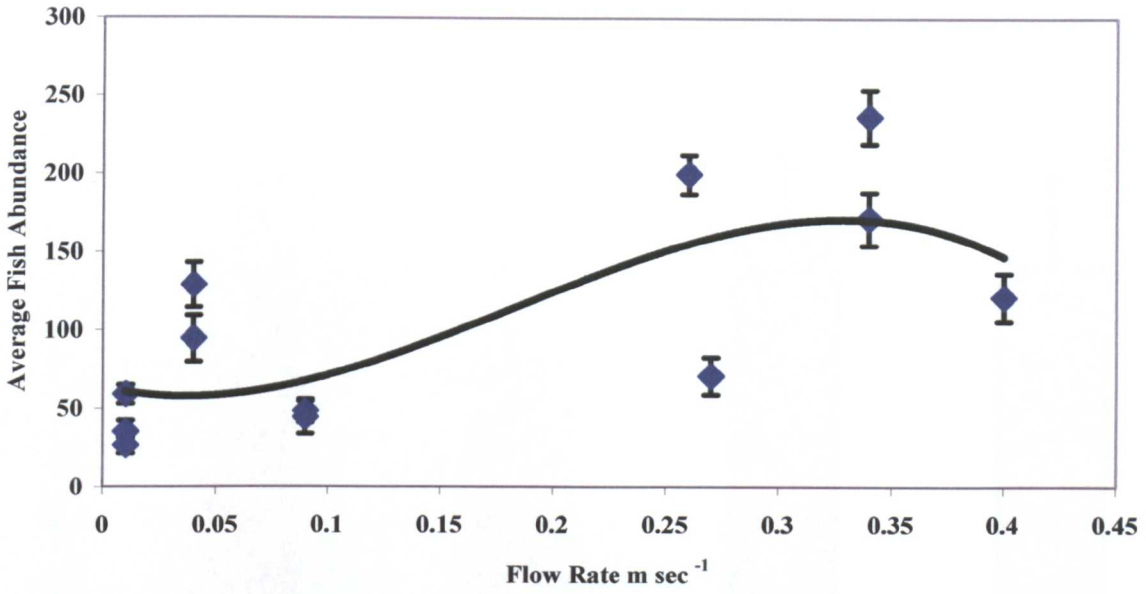


Figure 4.18: Best fit polynomial showing the relationship between fish abundance and flow rate measured 3 m from the mangrove fringe. Using a Spearman Rank Order Correlation, this relationship was shown to be highly significant ($p < 0.001$) when considering fish abundance data from all twelve sample sites. Recalculation using data from sites 1 – 8 also showed a highly significant relationship ($p < 0.001$). (Error Bars ± SE)

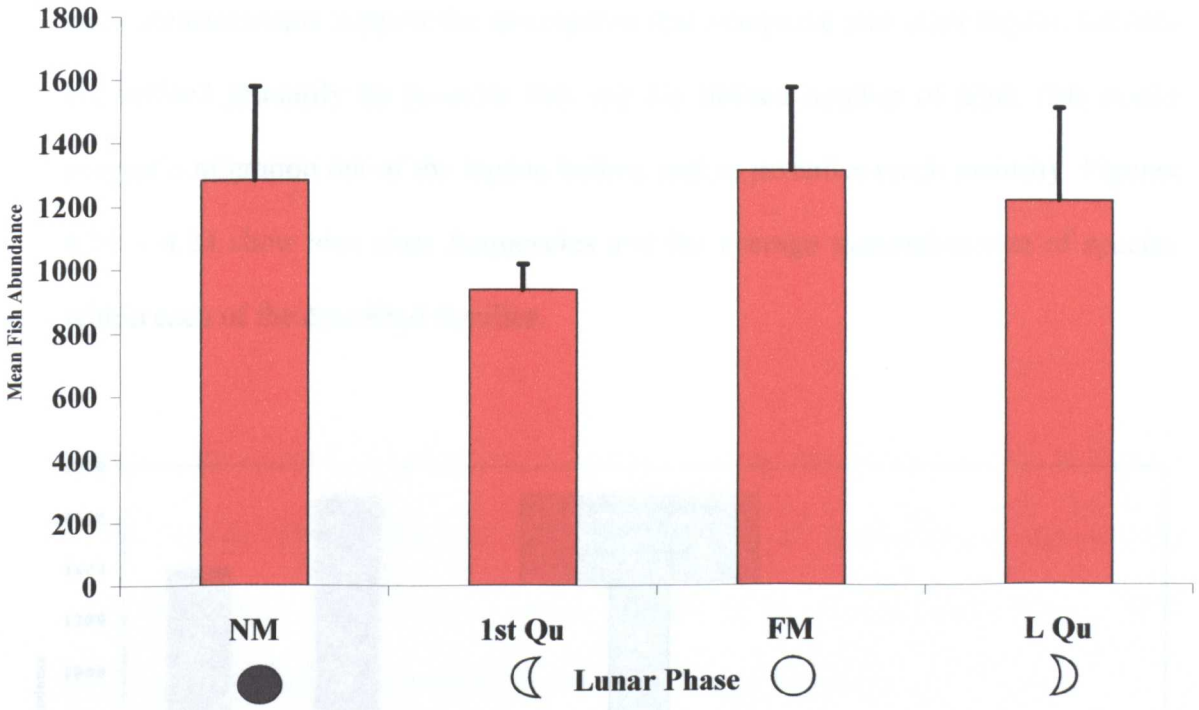


Figure 4.19: Mean abundance of fish counted at different phases of the lunar cycle. NM = new moon, 1st Qu = first quarter, FM = full moon, and L Qu = last quarter. The total number of fish counted on any particular sample day was apportioned to the nearest part of the lunar cycle ± 3 days. These values were combined and averaged to give mean abundance values for each lunar phase (Error Bars = SD).

4.4 Discussion

Pigeon Creek contained a high diversity and abundance of juvenile reef fish. Size class measurements support the assumption that mangrove and other lagoon habitats are utilised primarily by juvenile fish and the limited number of adult fish would suggest a migration out of the lagoon before, and as juveniles reach maturity. Figures 4.19 – 4.23 show size class frequencies and the average maturation size of species within each of the described families.

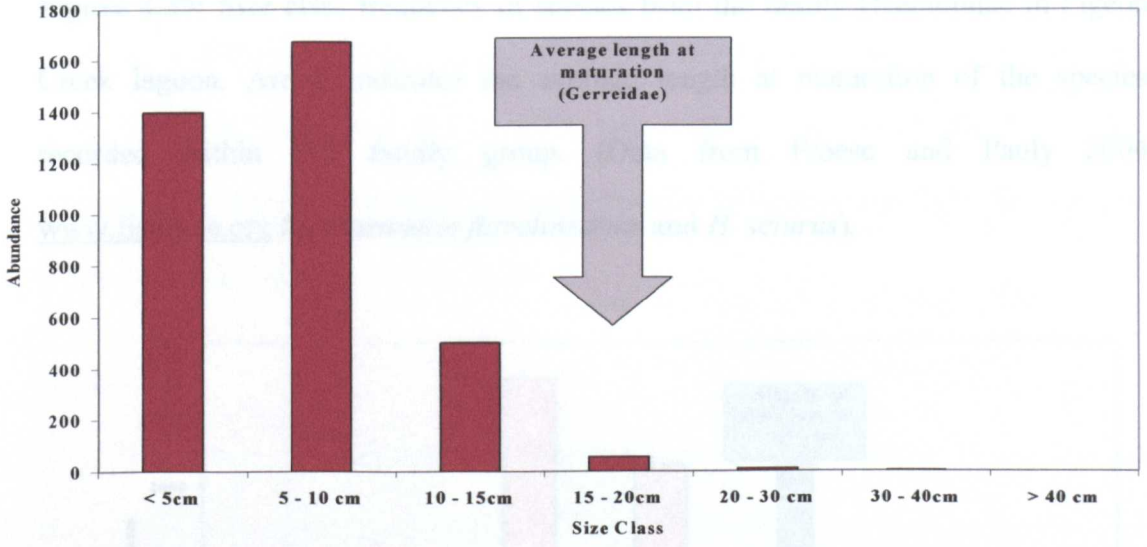


Figure 4.19: Size class frequency of species from the family Gerreidae in Pigeon Creek lagoon. Arrow indicates the average length at maturation of the species recorded within this family group. (Data from Froese and Pauly 2004 www.fishbase.org for *Gerres cinereus*)

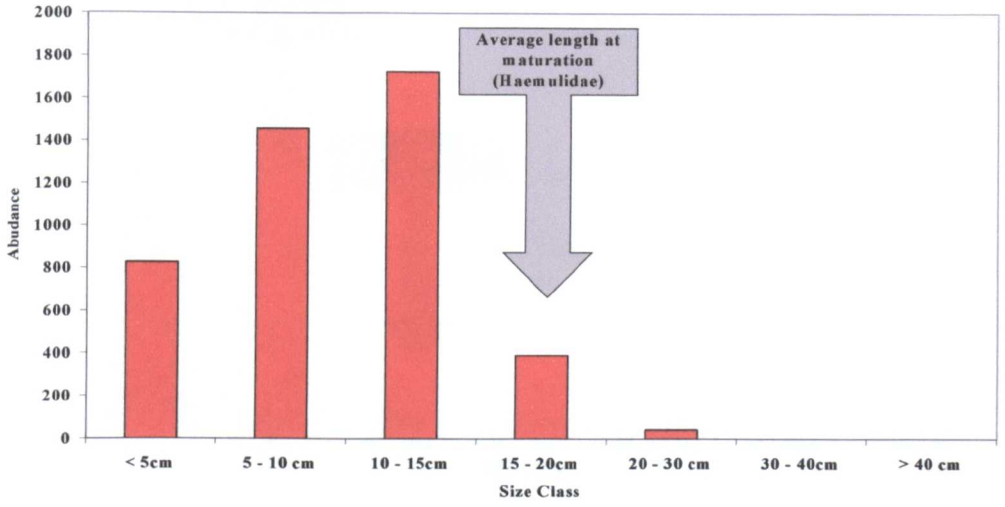


Figure 4.20: Size class frequency of species from the family Haemulidae in Pigeon Creek lagoon. Arrow indicates the average length at maturation of the species recorded within this family group. (Data from Froese and Pauly 2004 www.fishbase.org for *Haemulon flavolineatum* and *H. sciurus*).

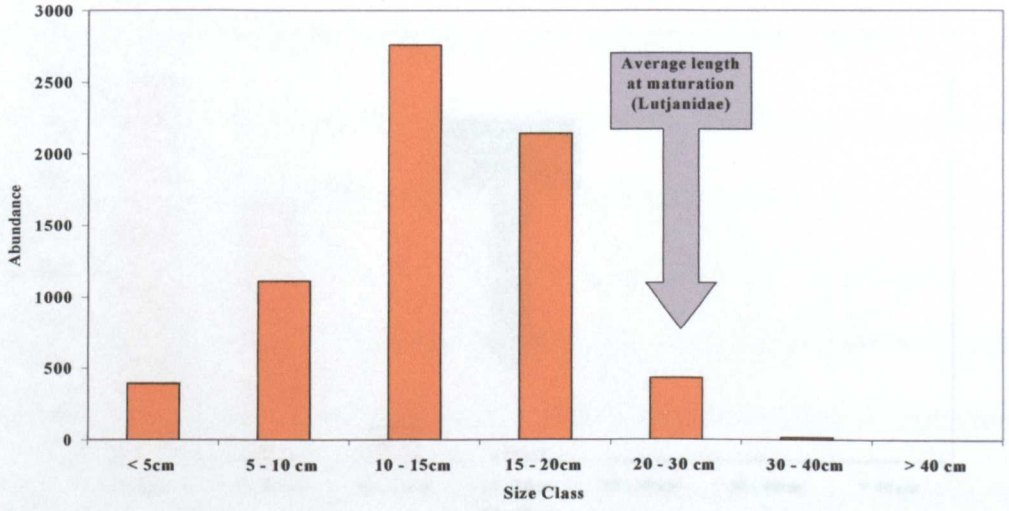


Figure 4.21: Size class frequency of species from the family Lutjanidae in Pigeon Creek lagoon. Arrow indicates the average length at maturation of the species recorded within this family group. (Data from Froese and Pauly 2004 www.fishbase.org for *Lutjanus apodus* and *L. griseus*)

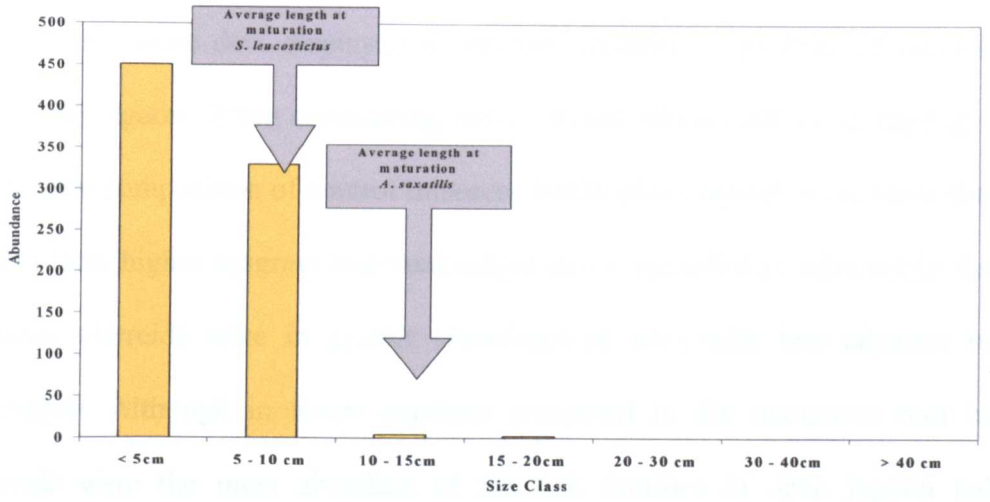


Figure 4.22: Size class frequency of species from the family Pomacentridae in Pigeon Creek lagoon. Arrow indicates the average length at maturation of the species recorded within this family group. (Data for *Abudefduf saxatilis* and *Stegastes leucostictus* estimated from Brown 1977, and references to Froese and Pauly 2002 www.fishbase.org (version 2002) although maturity information on these species is no longer listed on Fishbase version 2004.

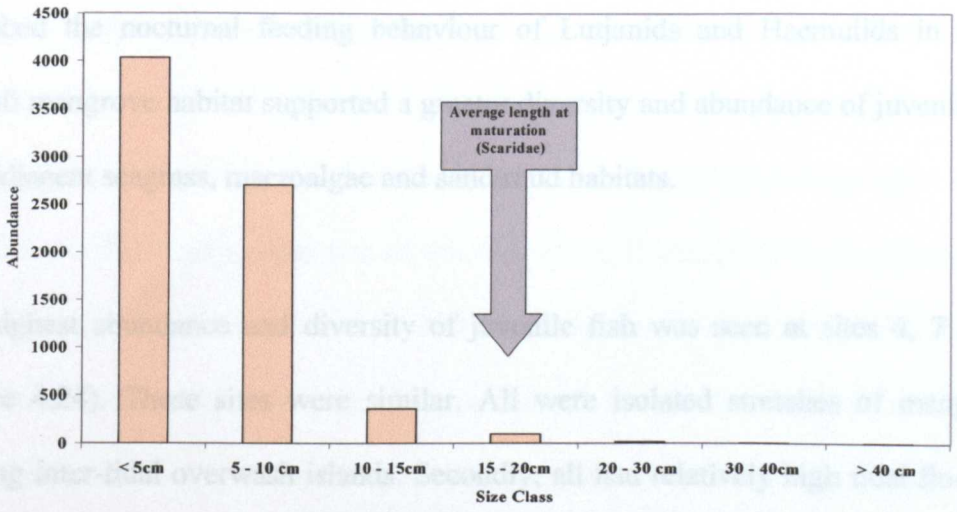


Figure 4.23: Size class frequency of species from the family Scaridae in Pigeon Creek lagoon. Arrow indicates the average length at maturation of the species recorded within this family group. (Data from Froese and Pauly 2004 www.fishbase.org for *Scarus croicensis* and *Scarus taeniopterus*)

Analysis of count data displayed distinctive distribution patterns of juvenile fish within the lagoon. When considering habitat distributions outlined in chapter 2, and the benthic composition of control transects, herbivorous Scarids were more abundant at sites with higher seagrass and macroalgae cover immediately adjacent to them. In contrast, Gerreids were in greater abundance at sites with less adjacent benthic vegetation. Although in fewer numbers compared to the mangrove root habitat, Gerreids were the most abundant of the fish families in open lagoon habitats. Reflective silver coloration camouflaged these fish in open water habitats with little vegetative cover. Gerreids have been described as being more common in bay or surf areas than in coral reef habitat (Nagelkerken *et al.* 2001). Lutjanids and Haemulids in particular *Lutjanus apodus*, *L. griseus*, *Haemulon flavolineatum* and *H. sciurus* were common in large resting schools in the mangrove root habitat. Being nocturnal zoobenthivores these families would likely migrate to other open bay biotopes to feed during the night. Ogden and Ehrlich (1977) and Nagelkerken *et al.* (2000b) have described the nocturnal feeding behaviour of Lutjanids and Haemulids in detail. Overall mangrove habitat supported a greater diversity and abundance of juvenile fish than adjacent seagrass, macroalgae and sand/mud habitats.

The highest abundance and diversity of juvenile fish was seen at sites 4, 7 and 8 (Figure 4.24). These sites were similar. All were isolated stretches of mangrove, fringing inter-tidal overwash islands. Secondly, all had relatively high tidal flow and regular flushing with each tidal cycle, and they were all located close to the deeper tidal channels of the lagoon. The higher numbers of fish at these sites may have been attributed to greater larval supply due to regular replenishment of oceanic waters and increased tidal flow. Relative site isolation may have reduced the likelihood of fish

migrating to other mangrove fringe sites. This theory was supported by the fact that during surveys, a number of fish with obvious identifying features (scars or markings) were consistently counted at the same site over a number of months of the study period. For the Lutjanids and Haemulids which were often found in mixed schools, there was safety in numbers from predators, and individuals or small groups may have been less likely to desert large resting schools in search of other root habitat. Furthermore, there may have been a regular food supply of planktonic larvae to these sites with every incoming and outgoing tide.

There was an overall pattern of summer/winter variation when considering all fish species, and the total fish count over the sampling period. Seasonality at the size class level within each family was far more difficult to interpret. However, seasonal patterns for some size classes of fish, notably 5 – 15 cm Lutjanids, indicated recruitment to mangrove habitat in smaller juveniles, and migration from this habitat in larger juveniles. It is possible that for larger juveniles this seasonality was an indication of ontogenetic migrations between lagoon habitats, but perhaps more likely, migration to nearby coral reef sites, given the limited protection other lagoon biotopes would afford to snappers of this size class. Cocheret de la Morinière *et al.* 2002, Cocheret de la Morinière *et al.* 2003 and Nagelkerken and van der Velde 2003 have described ontogenetic migrations in detail for shallow water bays in the Netherlands Antilles. Over the study period there were no findings that would suggest mass outward migrations from the lagoon of larger size classes (> 15 cm) of Lutjanids and Haemulids, indeed the most variable fluctuations in abundance throughout the study for these families were for sub-adult fish. Nevertheless, comparatively small numbers of mature fish in all of the families studied, strongly suggested migration

from the lagoon. Furthermore, given the small number of large piscivores such as Barracuda (*Sphyraena barracuda*) and Lemon Sharks (*Negaprion brevirostris*) it was unlikely that all larger juvenile were being preyed upon. With no clear pattern of fish export by any of the size classes at which the various species mature, it would seem reasonable to hypothesize that migrations from the lagoon were regular and perhaps diffuse events, and that no mass migrations of larger juveniles and newly matured fish to coral reef habitats occurred. This was corroborated further by the existence of a small but consistent population of adult reef fish in the lagoon.

Sites 10 and 11 were notable because they supported fewer fish than any other sites. Low flow rates and long distance from the lagoon opening were likely to have influenced this, but these were not the only factors responsible. Site 12 was similar in distance from the lagoon opening and had comparable water flow, yet at this site there were consistently greater abundances and diversity of fish (Figure 4.24). Site 12 differed in a variety of characteristics from sites 10 and 11. The main characteristics that differentiated these sites were depth, and, the composition of adjacent habitats. The habitat immediately adjacent to site 12 consisted of 40% seagrass, 20% macroalgae and 40% sand/mud. In contrast, sites 10 and 11 had only 2% seagrass cover and 98% sand/mud. It was likely that the area adjacent to site 12 harboured more food items amongst the benthic vegetation, than sites 10 and 11. Moreover, this vegetated area perhaps provided shelter for larval and post-larval fish to make their way to the mangrove fringe with a reduced probability of being preyed upon. The difference in abundance and diversity of juvenile fish between these sites suggested an interdependence of juvenile fish on not only the mangrove prop root habitat, but also on adjacent habitats such as seagrass and macroalgae beds.

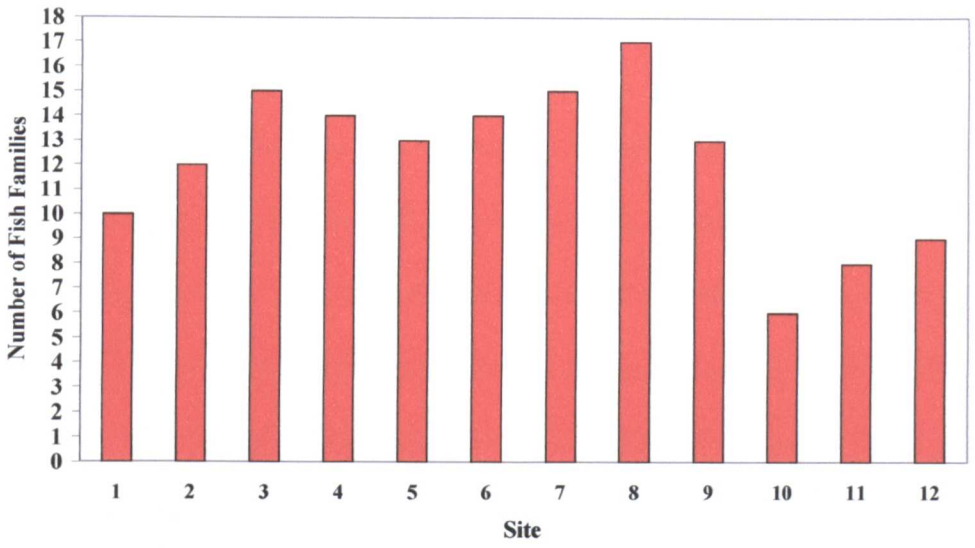


Figure 4.24: The number of families encountered at each sample site in mangrove root habitat over the duration of the study.

When disregarding data from the anomalous sites in the far reaches of the north/south arm of the lagoon, the physical parameters measured during the study appeared to have little affect on fish abundance, with the exception of tidal flow.

Stoner (2003) noted that demersal species can occupy a variety of habitats in their geographical range, but large areas of seemingly appropriate habitat may never be occupied. This is the case for the icthyofauna of mangrove prop root habitat in Pigeon Creek as implied by the variable fish abundances for each site. In addition, the data indicates that some species that school in large numbers such as the Lutjanids and Haemulids have a tendency to inhabit the same location for extended periods. Moreover, it appears that Scarids and Gerreids have preferences based on food sources i.e. vegetation and rich zoobenthos on open sand/mud habitat, and predation risk. Environmental factors such as flow rate are also responsible for determining juvenile fish distribution.

Chapter 5

Fish Preferences in Mangrove Prop Root Habitat

5.1 Introduction

In Pigeon Creek lagoon, mangrove prop root habitat supported a comparatively greater abundance and diversity of juvenile fish than adjacent biotopes. Distribution of juveniles within the mangrove fringe was variable and apparently suitable sites often had few individuals. Oceanographic features, and the spatial distribution of biotopes such as seagrass have been shown to influence juvenile fish distribution throughout the lagoon. However, when considering the utilisation of mangrove prop root habitat, other factors may be taken into account. Parrish (1989), Mullin (1995) and Laegdsgaard and Johnson (2001), all concur that juvenile reef fish utilise the well-shaded complex prop root structure to avoid predation. In addition, this habitat has also been considered a rich food source for the early growth stages of newly settled fish larvae (Heald and Odum 1970, Thayer *et al.* 1987). Only recently has there been investigations into what attracts juvenile fish to a particular habitat (Nagelkerken 2000, Laegdsgaard and Johnson 2001, Cocheret de la Morinière *et al.* 2004). The utilisation of bay biotopes in Spanish Water, Curaçao, by juvenile fish has been described in detail by (Nagelkerken 2000) who also identified the variables of water transparency, water depth, distance from the bay opening and habitat complexity in mangrove and seagrass habitat as correlating with juvenile fish species abundance and distribution. Investigations in the same location have also described ontogenetic shifts of different size classes of fish between habitats as sub-adult and adult fish migrate to adjacent coral reef systems (Cocheret de la Morinière *et al.* 2003). Little work has been done specifically on mangrove habitat, and it is not clear how much influence habitat shade and complexity or food availability have on habitat

choice or if different fish families or size classes of fish within families have variable preferences.

This chapter addresses the question, what makes some areas of mangrove prop root habitat more appealing to juvenile fish than others? This was done by correlating fish abundances to the physical features of mangrove trees found at a number of sample sites throughout Pigeon Creek lagoon.

5.2 Methods

5.2.1 Epiphytic algal biomass and species composition

Epiphytic prop root algae was sampled in June 2000, when fish abundances were reaching their annual peak. At each sample site six roots were randomly selected at six points equally spaced (approximately every 10 m) along the established 50m transects with the premise that the roots selected should have comparable algae growth to other roots within 1m each side of the sample root. The sample roots had two distinct areas of algal growth. One part of the root (upper) was inter-tidal, being submerged only some of the time, and, the second part (lower) was the end of the root submerged almost continuously, except during very low spring tides. Algae was scraped from the prop root directly into a Ziploc® bag using the blunt side of a knife. The length of the scraped section was then measured using a measuring tape. At five equally spaced intervals along the scraped length the circumference of the root was measured by wrapping the tape around the root. Following this the lower section of the root was sampled in the same manner. Data was recorded on a dive slate and the

scraped area for each root section calculated by averaging the circumferences and multiplying by the length.

The wet algae samples were cleaned, sieved, dried and weighed. In all, 144 samples were taken from 72 roots. Dry weight results for each root could be compared to the root area and a measurement of algae biomass cm^{-2} calculated. This was then averaged across the six roots to give a mean value for each site.

In addition, during sampling in June 2000, two roots were selected at each site and algae scraped from these were identified to species level to give an overview of species distribution on individual roots and throughout the lagoon.

5.2.2 Prop root densities

One side of a $1m^{-2}$ quadrat (constructed using 19mm PVC pipe) was removed, forming an open square, this was then used to measure root density. At the start of each transect, the open side of the quadrat was pushed into the prop roots and the number of roots inside the quadrat counted. Roots that touched the substrate as well as those hanging over in to the quadrat were recorded. The quadrat was then pulled back out of the root fringe, flipped over and pushed back into the root system (x50) to record root numbers in the next metre of fringe.

5.2.3 Light penetration through prop roots and tree canopy

Onset® Hobo Light Intensity Loggers were used to calculate the shade properties of both leaf canopy and prop roots at each of the twelve sampling sites.

Firstly, a device was designed to which the light loggers could be attached, that would enable the logger to be pushed 1m into the root fringe. The light meters were programmed to record data (launched) by computer, placed in water tight housings and recorded light intensity continuously. Consequently, it was necessary to design a holding device (Light Logger Mounting Device, LLMD) which when manipulated could place the light meters in darkness between samples. This prevented the light meter being exposed to light other than that found 1m into the mangrove fringe, furthermore, periods of zero light values in the recorded data acted as a reference point between each series of measurements.

5.2.4 Light Logger Mounting Device (LLMD) construction

Three 300 mm lengths of 102 mm diameter PVC pipe were cut and capped at both ends (giving a total length of 400 mm). On one of the lengths (A) a reducing cap (102 mm to 32 mm) was used at one end instead of a closed cap, and a 600mm length of 32 mm PVC pipe was glued into the cap (Figure 5.1(II)).

Using a band saw, oval shaped doors (of equal size) were cut out of each of the 300 mm, 102 mm diameter PVC lengths. A short 150 mm length of 25.4 mm PVC was attached to two of the doors as handles (B), using stainless steel screws. On the other

door (C), a 600 mm length of 25.4 mm PVC was attached. Altogether, one long and two short LLMDs were constructed, one 1000 mm in length and two 400 mm in length. Two small holes were drilled on the inside of the units so that the underwater light meter housings could be attached using a plastic cable tie. Each of the units were sprayed with black paint to reduce sunlight reflection from the LLMD structure.

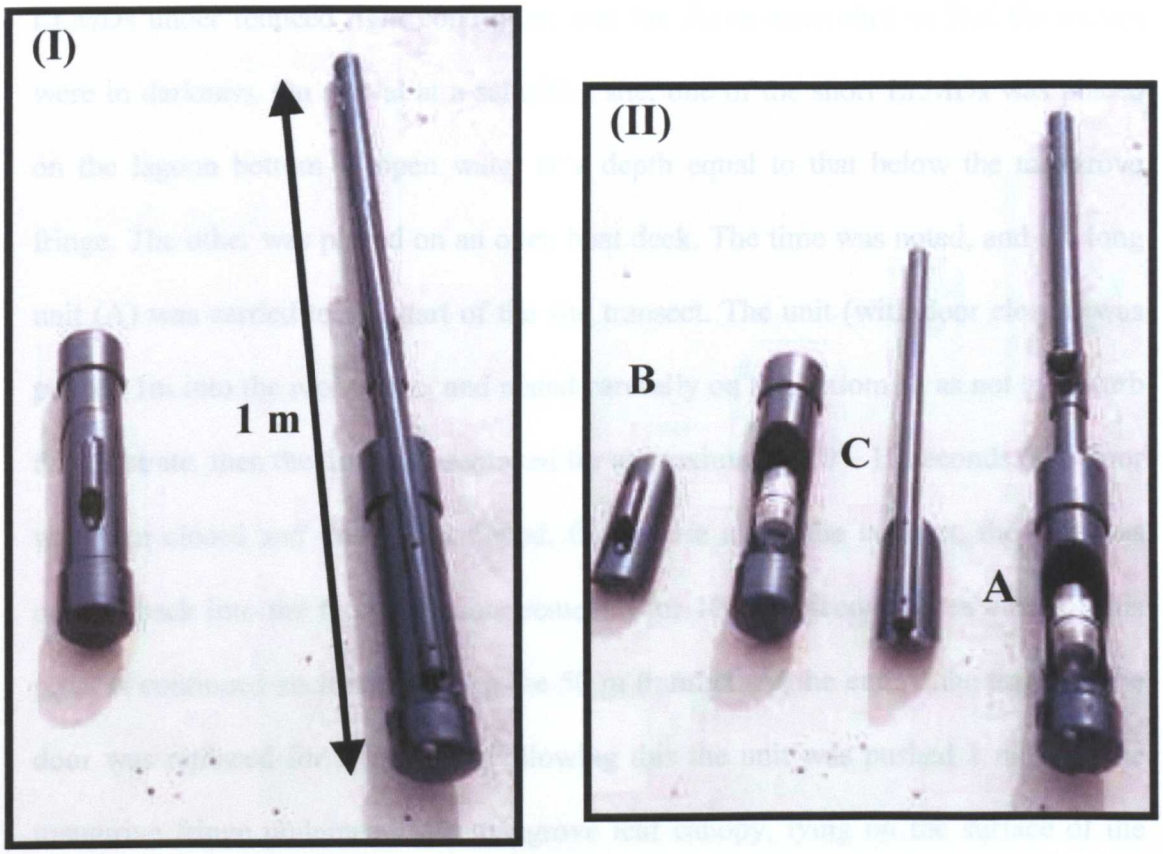


Figure 5.1: Light Logger Mounting Devices (LLMD) used to mount Onset® Hobo Light Intensity Loggers to record light penetrating through red mangrove canopy and roots in Pigeon Creek lagoon. (I) Shows LLMDs with doors closed. (II) Shows LLMD with doors open and light meters recording light intensity.

5.2.5 LLMD sampling method

Light meters were calibrated to one another under an intense artificial light source in a darkened room so that any corrections could be made following sampling. The meters were then launched to record light intensity in log lumens m^{-2} every five seconds. They were then placed in transparent underwater housings, attached to the LLMDs under reduced light conditions, and the doors were shut so that the meters were in darkness. On arrival at a sampling site, one of the short LLMDs was placed on the lagoon bottom in open water at a depth equal to that below the mangrove fringe. The other was placed on an open boat deck. The time was noted, and the long unit (A) was carried to the start of the site transect. The unit (with door closed) was pushed 1m into the root fringe, and rested carefully on the bottom so as not to disturb the substrate, then the door was removed for approximately 10 – 15 seconds. The door was then closed and the unit removed. One metre along the transect, the unit was pushed back into the roots, the door removed for 10 – 15 seconds then closed. This process continued each metre along the 50 m transect. At the end of the transect, the door was replaced for 2 minutes. Following this the unit was pushed 1 m in to the mangrove fringe underneath the mangrove leaf canopy, lying on the surface of the water, the door was removed for 10 – 15 seconds and the procedure continued back along the transect line.

By recording light intensity simultaneously with the meter on the lagoon bottom in open water, and on the boat in open air, cloud cover, normal daily light variations and water clarity at each site could be accounted for when calculating the shade properties of both the leaf canopy and the root system.

The light measurement recorded at each site varied depending on the number of measurements recorded while the LLMD door was opened. Some deletions had to be made due to accidental shading of the light logger by the boat's outboard motor as the shadow cast by the sun intermittently shaded the logger while the boat drifted back and forth in the breeze.

Corrections were also made to reduce the difference between logger launch times (the maximum difference in recording time between loggers was 3 seconds).

5.2.6 Data analysis

Comparison between upper and lower root algae biomass was done using a Mann-Whitney rank sum test on non-transformed dry weight data.

It was previously determined that fish abundance correlated significantly and negatively with distance from the lagoon opening, but only when the analysis included sites 9 – 12. In order to determine significance of correlation with biological and physical factors such as algae biomass, shade and root density the geographic variable of distance was omitted from the analysis by only considering data from site 1 – 8, to eliminate the influence of distance as a factor affecting fish abundance. However, doing this is not without risk in that it reduces the statistical power of any correlations given that the number of independent variable data points is being reduced. There is an increased risk of a type 1 error, rejecting the null hypothesis when in fact it is true.

Normal distribution of residuals, and constant variance tests were not met for a linear regression analysis of physical factors against fish abundances. Consequently, algae biomass, root density and light intensity data from sites 1 - 8 were correlated with non-transformed fish abundance data from each site using a Spearman rank order correlation to determine any relationship. This perhaps reduced the risk of type 1 errors, as the difference in population medians needs to be greater to find significant differences using non-parametric tests. Indeed, there is more likelihood of a type 2 error using rank tests.

5.3 Results

5.3.1 Epiphytic algae biomass, species composition and the affect on juvenile fish abundance.

The amount of algae scraped from the prop roots varied from 0.31 g (dry weight) at site 5 to 18.20 g at site 6, and averaged 5.1 g for all sites (Table 5.1). The high abundance of algae at site 6 was atypical, and perhaps due to a combination of relatively high flow rates, low root density and poor canopy shade properties. There was no particular spatial pattern in algae abundance throughout the lagoon.

Table 5.1: Average dry weight of mangrove prop root macroalgal epiphytes recorded at sample sites in Pigeon Creek in June 2000.

Summer (June 2000)	Dry Weight (g)	SE	Dry Weight (g cm^{-2})
Site 1	4.91	1.44	0.026
Site 2	3.43	1.05	0.010
Site 3	1.31	0.42	0.009
Site 4	4.64	1.78	0.019
Site 5	0.31	0.12	0.001
Site 6	18.20	5.53	0.061
Site 7	6.39	1.45	0.022
Site 8	7.91	1.65	0.030
Site 9	2.12	0.79	0.009
Site 10	3.36	0.90	0.019
Site 11	2.72	1.17	0.016
Site 12	5.99	4.07	0.011

The biomass of algal epiphytes was significantly greater on the lower submerged portion of the root, the difference in the median biomass values between the upper and lower root samples were greater than expected by chance (Mann-Whitney rank sum test $p < 0.001$).

Average algae dry weight data was plotted against average fish abundance data for the five most abundant family groups; snappers, grunts, damselfish, parrotfish and mojarras (Figure 5.2). This analysis showed a significant positive relationship (Spearman rank order correlation $p < 0.001$). This relationship may have been related to food availability for some species within the family groups such as the herbivorous bucktooth parrotfish (*Sparisoma radians*) or french and bluestriped grunts (*Haemulon flavolineatum and H. striatus*) which may have consumed invertebrates living amongst the algae. Apart from being a food source themselves, algal epiphytes on prop roots provided habitat for many invertebrates. Microscopic observations on algal epiphytes from one 35cm long root showed a great diversity and abundance of invertebrates. Copepods were most abundant in 10s – 100s cm^{-3}; Ostracods were also

abundant in slightly fewer numbers than the copepods. Polychaete and nemotode worms ranged between 1 – 10 cm^{-3}, and isopod and amphipod crustaceans approximately 1 4 cm^{-3}. There were 5 gastropods, 1 decapod crustacean, 1 sea cucumber (holothuroid) and 1 feather duster worm (Sabellid, Annelida).

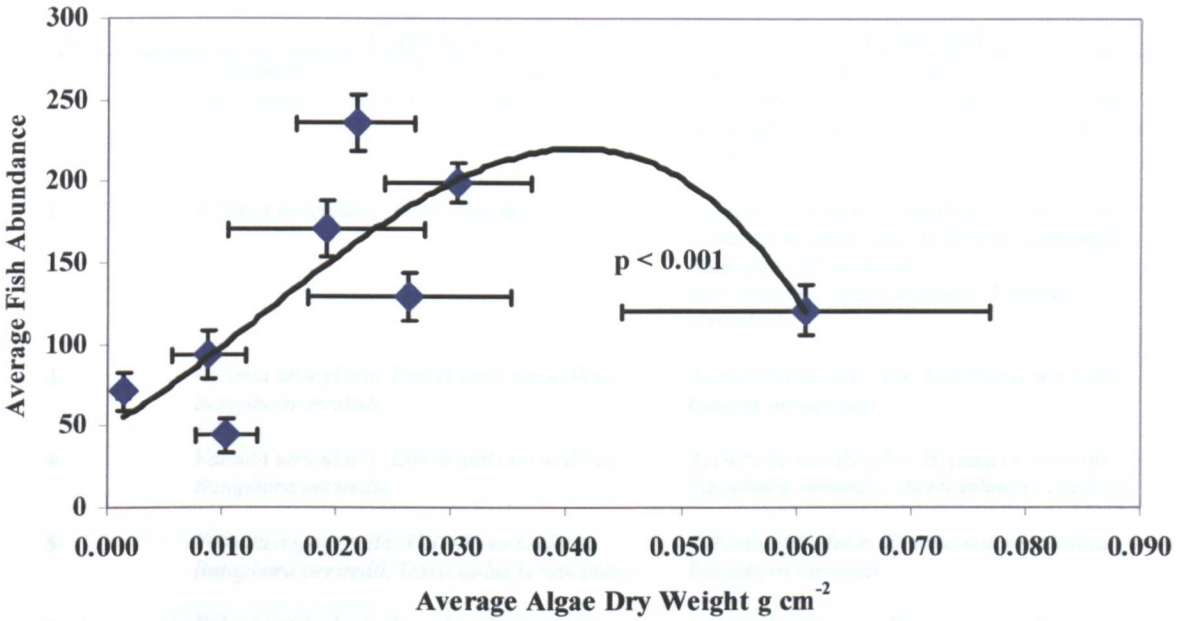


Figure 5.2: Average fish abundance plotted against average dry weight of macro algal epiphytes at each of eight sample sites. Data for all twelve sites also exhibited a positive and significant correlation, but in order to eliminate distance from the lagoon opening as an influential factor affecting fish abundance, sites 9 – 12 were omitted from the analysis. Vertical and horizontal error bars = SE.

Table 5.2: Macroalgae species from root scrapings at each of twelve sample sites in Pigeon Creek lagoon. Upper root describes the portion of the root exposed during mean low tide and the lower root describes that generally submerged except during low spring tides.

	Macroalgae Species Collected	
Site	**Upper Root**	**Lower Root**
1	*Cladophora prolifera, Batophora oerstedii, Dasycladus vermicularis, Valonia utricularis*	*Batophora oerstedii, Ventricaria ventricosa, Ulva fasciata, Bostrychia montagnei, Valonia macrophysa, Cladophora prolifera, Ernodesmis verticillata*
2	*Valonia utricularis, Bostrychia montagnei*	*Laurencia intricata, Acetabularia calyculus, Ventricaria ventricosa, Bostrychia montagnei, Rhopallaea abdominalis, Ulva fasciata, Jania adherens, Valonia utricularis*
3	*Valonia utricularis, Ernodesmis verticillata, Batophora oerstedii*	*Acetabularia calyculus, Batophora oerstedii, Laurencia intricata*
4	*Valonia utricularis, Ernodesmis verticillata, Batophora oerstedii*	*Acetabularia calyculus, Hypnea cervicornis, Batophora oerstedii, Dictyosphaeria ocellata*
5	*Valonia aegagropila, Valonia utricularis, Batophora oerstedii, Dasycladus vermicularis*	*Valonia utricularis, Ernodesmis verticillata, Batophora oerstedii*
6	*Valonia utricularis, Ernodesmis verticillata, Batophora oerstedii, Cladophora prolifera*	*Laurencia intricata, Laurencia papillosa, Batophora oerstedii, Dasycladus vermicularis, Rosenvingea intricata*
7	*Valonia utricularis, Batophora oerstedii, Dasycladus vermicularis, Cladophora prolifera*	*Acetabularia calyculus, Ulva fasciata, Laurencia intricata, Dasycladus vermicularis, Batophora oerstedii, Rosenvingea intricata*
8	*Rosenvingea sanctaecrucis, Batophora oerstedii, Dasycladus vermicularis*	*Acetabularia calyculus, Laurencia papillosa, Batophora oerstedii, Bostrychia montagnei, Ulva fasciata,*
9	*Rosenvingea intricata, Ernodesmis verticillata, Dasycladus vermicularis, Batophora oerstedii*	*Acetabularia calyculus, Laurencia intricata, Batophora oerstedii, Ulva fasciata, Dictyosphaeria ocellata*
10	*Ernodesmis verticillata, Batophora oerstedii*	*Batophora oerstedii, Acetabularia calyculus, Ulva fasciata*
11	*Batophora oerstedii*	*Batophora oerstedii, Acetabularia calyculus*
12	*Ernodesmis verticillata, Batophora oerstedii*	*Acetabularia calyculus, Laurencia intricata, Batophora oerstedii*

Species of algae collected from roots at each sample site (Table 5.2), shows species which commonly foul mangrove prop roots in the lagoon, and those with the capacity to live intertidally. Fewer species were able to live on the upper intertidal portion of the prop root than the lower portion. Most species found on the intertidal portion of the root were also found on the submerged part. Only two species were found exclusively on the upper root *Valonia aegagropila* and *Rosenvingea santaecrucis.* Many species common on the submerged part of the root were not found on the intertidal portion. Epiphyte species richness was less in the upper reaches of the north/south arm of the lagoon, where flow rate and water exchange was limited, and salinities were generally higher.

5.3.2 Prop root densities and the affect on juvenile fish abundance

Root densities recorded from each sample site ranged from 0 – 45 roots m^{-2}. Sites with the greatest variability in root density along the sample transect included sites 1, 5, 7, 10 and 11, as indicated by the comparatively high standard error values. Sites 1 and 5 had the greatest total root counts 1057 and 1155 50 m^{-2}. Root densities showed no particular pattern of spatial variation throughout the lagoon.

When correlated, fish abundance and root density showed a significant relationship. The trend of the data points presented in Figure 5.3 indicated lower abundances of juvenile fish at sites with lower average root densities, increasing to a maximum at sites with an average of 17 – 19 roots m^{-2} then decreasing as the average root density increased.

Table 5.3: Maximum, minimum, mean (± SE) and total root densities at sample sites in Pigeon Creek lagoon.

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12
Mean number of roots m^{-2}	21	13	14	19	23	14	17	15	12	15	20	13
SE	1.3	0.9	0.9	1.0	1.2	0.8	1.2	0.8	0.5	1.5	1.2	0.6
Minimum number of roots m^{-2}	0	4	5	8	7	1	0	4	5	0	4	4
Maximum number of roots m^{-2}	39	30	28	37	45	29	44	31	19	39	38	23
Total number of roots ($50m^{-2}$)	1057	662	687	939	1155	687	854	731	601	762	989	646

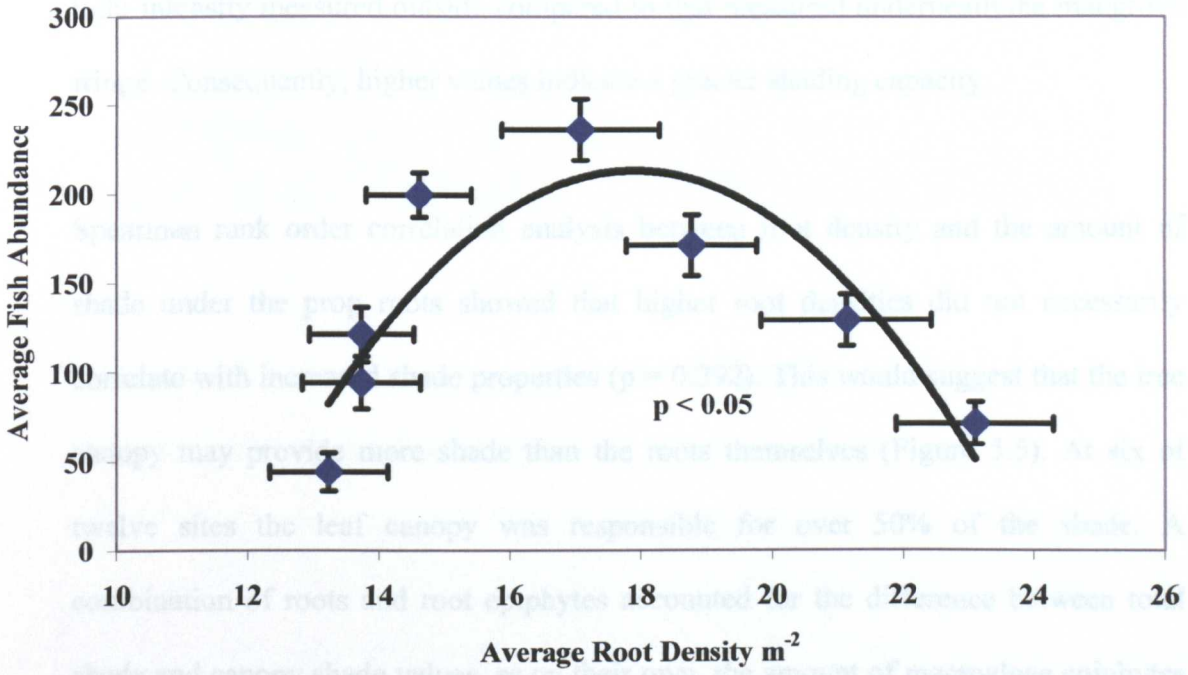


Figure 5.3: The relationship between fish abundance and root density recorded at sites 1 - 8. Data for all twelve sites also exhibited a similar significant correlation, but in order to eliminate distance from the lagoon opening as an influential factor affecting fish abundance, sites 9 – 12 were omitted from the analysis. Vertical and horizontal error bars = SE.

5.3.3 Light penetration through prop roots and tree canopy and the affect on juvenile fish abundance.

The results presented in Table 5.4 a and b, show the difference between light intensity measured in open water and under prop roots, from that measured from the deck of the research boat and under the mangrove canopy at each sample site. Subtracting light intensity values for under the mangrove prop roots and the leaf canopy from open water and open air respectively gave an indication of the shade properties of the mangrove trees at each site. The higher values show there is a greater difference in the light intensity measured outside compared to that measured underneath the mangrove fringe. Consequently, higher values indicate a greater shading capacity.

Spearman rank order correlation analysis between root density and the amount of shade under the prop roots showed that higher root densities did not necessarily correlate with increased shade properties ($p = 0.292$). This would suggest that the tree canopy may provide more shade than the roots themselves (Figure 5.5). At six of twelve sites the leaf canopy was responsible for over 50% of the shade. A combination of roots and root epiphytes accounted for the difference between total shade and canopy shade values, as on their own, the amount of macroalgae epiphytes had no significant influence on shade at the sites sampled ($p = 0.369$).

Low values such as those found at sites 5, 6, 10, 11 and 12 may indicate low tree canopy density which is one characteristic of stress commonly found in *Rhizophora mangle* trees in the Bahamas. This may be particularly apparent at sites 10, 11 and 12 where salinities were generally higher. Typically, red mangrove trees in the lagoon

were stunted, the tree canopy was thinned and many of the leaves were discoloured (Figure 5.4).

Figure 5.4: A typical mangrove stand in Pigeon Creek lagoon. Note the dwarf trees, thinned tree canopy and discoloured leaves, all indications of stress.

Table 5.4a: Light intensity readings below mangrove prop roots (log lumens m^{-2}) recorded using Onset® Hobo Light Intensity Loggers at twelve sample sites in Pigeon Creek lagoon.

a.

SITE	Samples (n)	Open	Roots	Open - Roots	Open - Root (SE)
1	n=36	3.80	2.43	1.36	0.16
2	n=37	3.37	2.05	1.32	0.06
3	n=39	2.97	1.60	1.37	0.07
4	n=42	3.44	2.29	1.15	0.10
5	n=40	3.24	2.24	1.00	0.04
6	n=42	3.56	2.58	0.98	0.10
7	n=42	3.88	2.24	1.64	0.07
8	n=51	3.67	2.19	1.48	0.09
9	n=46	3.11	1.98	1.13	0.08
10	n=33	3.58	2.83	0.76	0.07
11	n=34	3.65	2.62	1.03	0.05
12	n=31	3.42	2.55	0.88	0.09

Table 5.4b Light intensity readings below mangrove canopy (log lumens m^{-2}) recorded using Onset® Hobo Light Intensity Loggers at twelve sample sites in Pigeon Creek lagoon.

b.

SITE	Samples (n)	Boat	Canopy	Boat- Canopy	Boat - Canopy (SE)
1	n=35	3.59	2.52	1.07	0.18
2	n=24	3.28	2.87	0.40	0.18
3	n=34	2.98	2.44	0.54	0.04
4	n=29	3.31	2.48	0.83	0.17
5	n=30	3.10	2.68	0.41	0.09
6	n=11	3.59	3.16	0.43	0.13
7	n=32	3.54	2.59	0.94	0.11
8	n=33	3.12	2.34	0.77	0.19
9	n=18	3.69	2.58	1.11	0.15
10	n=8	2.88	2.80	0.08	0.02
11	n=10	3.29	2.81	0.48	0.09
12	n=18	3.55	3.03	0.52	0.06

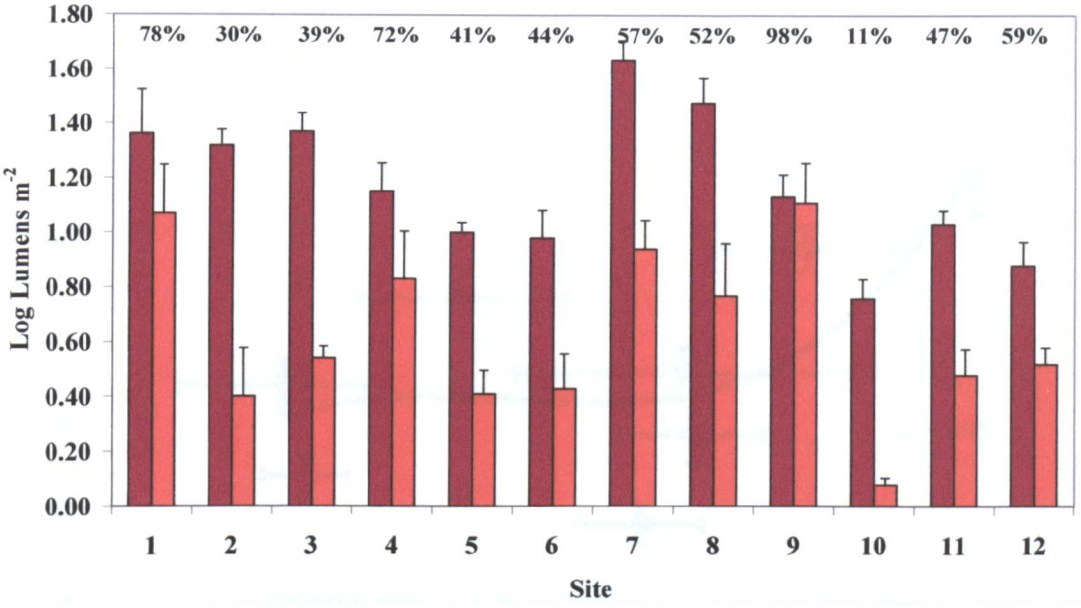


Figure 5.5: Light intensity recorded in the open water compared to that under mangrove roots at each sample site (maroon bars). And, difference between light intensity recorded in the open boat compared to that under mangrove canopy at each sample site (orange bars). Higher light values indicate greater amount of shade. The percentage values indicate the proportion of total shade that is produced by the canopy only. Error bars = +SE.

Sites 7 and 8 show the greatest shade properties of all the sample sites (Figure 5.5) and site 10 the least. The higher shade values correlate with high fish abundances at sites 7 and 8 and low abundances at site 10. Figure 5.6 shows the relationship between average fish abundance and against light intensity (shade value). Increased values along the x-axis indicate an increase in shade. Therefore, there was a significant positive correlation between fish abundance and the amount of shade provided by the mangrove canopy and roots.

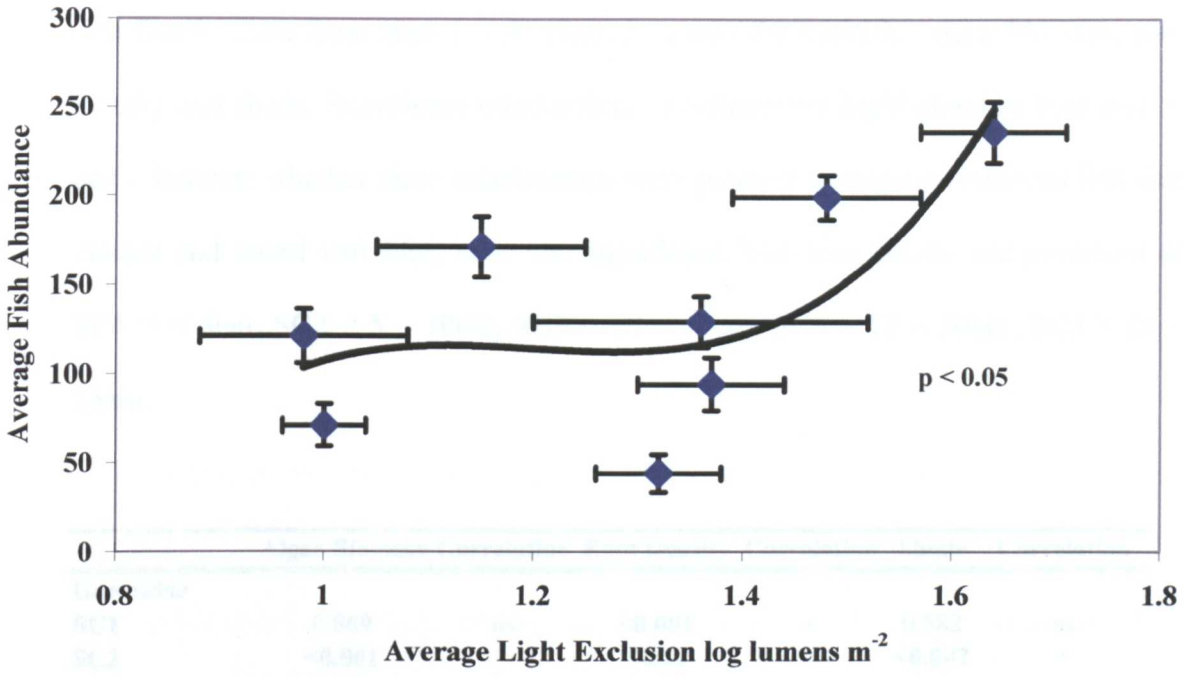


Figure 5.6: Average fish abundance plotted against light intensity/shade value. Increased values along the x-axis indicate an increase in shade. Data for all twelve sites also exhibited a positive and significant correlation, but in order to eliminate distance from the lagoon opening as an influential factor affecting fish abundance, sites 9 – 12 were omitted from the analysis. Vertical and horizontal error bars = SE.

The relationship between juvenile fish abundance and algae biomass, shade and root density was tested more specifically between family groups and size classes of fish within families. Several different size classes within the five main fish families correlated significantly and positively with the variables tested (Table 5.5).

Table 5.5: Spearman rank order correlation results for different size classes in each fish family (data from sites 1 – 8) plotted against the variables algae biomass, root density and shade. Significant relationships (p-values) are highlighted in bold text. + and – indicate whether these relationships were positive or negative between fish size classes and tested variables, ns = non significant. Fish size classes are presented as SC1 = < 5cm, SC2 = 5 – 10cm, SC3 = 10 – 15cm, SC4 = 15 – 20cm, SC5 = 20 – 25cm.

	Algae Biomass	Correlation	Root Density	Correlation	Shade	Correlation
Gerreidae						
SC1	0.869	ns	**<0.001**	+	0.582	ns
SC2	**<0.001**	+	**<0.10**	+	**<0.002**	+
SC3	0.483	ns	0.777	ns	**<0.002**	+
SC4	**<0.002**	-	0.198	ns	0.44	ns
Haemulidae						
SC1	0.234	ns	0.896	ns	**<0.001**	+
SC2	**<0.001**	+	0.117	ns	**<0.001**	+
SC3	**<0.05**	+	**<0.05**	+	**<0.001**	+
SC4	0.873	ns	**<0.05**	+	0.731	ns
Lutjanidae						
SC1	0.287	ns	**<0.001**	+	0.30	ns
SC2	0.276	ns	**<0.01**	+	**<0.10**	+
SC3	**<0.10**	+	0.334	ns	**<0.001**	+
SC4	**<0.001**	+	0.435	ns	**<0.001**	+
SC5	**<0.01**	+	0.518	ns	**<0.05**	+
Pomacentridae						
SC1	**<0.01**	+	**<0.10**	+	0.422	ns
SC2	**<0.001**	+	<0.199	ns	**<0.10**	+
Scaridae						
SC1	**<0.01**	+	**<0.05**	-	**<0.10**	+
SC2	0.175	ns	**<0.01**	+	**<0.001**	-
SC3	0.793	ns	0.932	ns	0.118	ns

The smallest size class of Gerreids (mojarras) (< 5 cm) showed a positive relationship with root density. Only the size class SC2 showed a positive correlation with algae biomass, and other size classes had either a negative or no relationship. Shade was

important for mojarras 5 - 15 cm in length, but showed no correlation in other size classes. The smallest size classes of Gerreids may seek the protection of the prop root system, larger 5 – 15 cm fish were attracted more to shaded areas with no influence from root density, but larger individuals showed no preference for either increased root density or shade possibly indicating a preferred utilisation of open water habitat where adult Gerrids were most commonly observed, and only an intermittent use of the mangrove habitat.

Algae biomass, and shade were important to the SC1 – SC3 grunts. Living amongst the prop roots, the invertebrate fauna associated with the fouling algae community may have acted as a food source for the SC2 and SC3 grunts which possibly supplemented their nighttime foraging activities, maximising their growth rate. SC1-SC3 showed a positive correlation with shade and SC3 and 4 with increased root density. As grunts increased in size they were less inclined to populate areas with high algae biomass. This perhaps signifies a general shift in food preference and a greater dependence on larger, or different prey items consumed during nocturnal zoobenthic foraging in neighbouring seagrass beds, or a shift of larger individuals to the coral reef. This would prompt a less specific utilisation of the mangrove prop root habitat, where shade and root density or perhaps schooling behaviour was more significant in choosing an area in which to rest. For the Lutjanids (snappers), abundance in relation to algae biomass proved to be positively significant for SC3 – SC5 juveniles, snappers may also have supplemented their diet by consuming prop root epifauna, or alternatively this significant relationship may have been coincidental due to large counts of schooling snappers which happened to occupy sites with greater algae growth. Smaller size classes (SC1 & 2) were positively correlated with root density

and for all size classes above SC1 shade was important. The smallest size class of Pomacentrids (damselfish) showed significant correlations with algae biomass and root density. Damselfishes 5 – 10 cm in length correlated positively with algae biomass and shade but negatively with root density. The Scarids (parrotfish) in the smallest size class correlated positively with all variables. SC2 Scarids correlated positively with root density and shade. No relationships were evident between the tested variables and the abundance of parrotfish 10 – 15 cm in length. The apparent lack of preference for sites with greater algal biomass by herbivorous parrotfish 5 – 15 cm in length may be explained by the consumption of seagrass and seagrass epiphytes adjacent to mangrove prop root habitat by bucktooth parrotfishes. This species was often observed darting into the cover of seagrass whilst sampling was taking place, and this was perhaps a preferred habitat albeit immediately adjacent to the mangrove fringe.

Overall most juveniles (67% of those family size classes observed) showed a significant positive correlation with shade provided by the mangrove trees. Root density was less important for most juvenile fish with 50% of the different family size classes correlating positively. Nine out of eighteen family size classes correlated positively with algae biomass, seven showed no preference and only one family size class (SC4 Gerreids) was negatively correlated.

5.4 Discussion

Laegdsgaard and Johnson (2001) used laboratory based manipulations and artificial structures in the field to investigate associations between three species of juvenile

fish, and habitat structure and food availability (in the form of fouling algae and its associated epifauna). One of the three species studied showed a strong preference towards artificial structure with fouling algae as opposed to that without. The present study has indicated that some fish species and various size classes of fish within species also have a preference for mangrove habitat with greater biomass of fouling algae. Laegdsgaard and Johnson (2001) concluded that the most important aspect of the mangrove habitat was a complex mangrove structure which provided the maximum availability of food and minimum incidence of predation. The findings of this study agree with this in part, but food availability and habitat complexity were less important to most fish than shade. This outcome may be explained by considering the behaviour of the juvenile fish species being counted. Large numbers of 10 - 20 cm snappers and grunts formed resting schools under the mangrove fringe during the day. Their feeding habits as nocturnal zoobenthivores and piscivores could have been expected to preclude any specific preferences for sites with high algae biomass. However, this appeared not to be the case, and either the Lutjanids and Haemulids were supplementing their nocturnal foraging with prop root epifauna, or large schools of fish at sites which happened to have high algae biomass, biased the results. Food preferences have been considered as a mechanism for triggering ontogenetic shifts in juvenile fish to coral reefs where visibility is better and the preferred food item is more abundant (Cocheret de la Morinière *et al.* 2003). Furthermore, diets in juveniles have been shown to be extremely varied, and change as their body size increases (Cocheret de la Morinière *et al.* 2003). Therefore dietary needs may influence the utilisation of the prop root habitat by larger individuals.

It is possible that at lower root densities juveniles are more exposed to predation, but at higher densities, roots may obscure the field of view making it more difficult to see predators approaching. Therefore fish may seek an optimal habitat complexity, which balances the risk of predation. The flight response by juvenile fish when being pursued by a predator may also be hampered by a root system which is too complex. However, a system with less complexity may decrease the probability of a successful escape. Habitat complexity appeared not to be a significant factor in the choice of prop root habitat for snappers, which was likely due to their schooling behaviour reducing the possibility of predation. Large body size may also have reduced the need for a complex protective structure as shown by Laegdsgaard and Johnson (2001) who determined that larger individuals were less inclined to seek shelter in the presence of a predator compared to smaller individuals.

The overwhelming preference for more shaded habitat by most size classes in all fish family groups may be explained by work carried out by Helfman (1981). He determined that it is easier for fish located in the shade to see predators further away, than it was for predatory fish to see prey in the shade. Overall the visibility of an object underwater depended largely on contrast of the object against its background. Many of the species sampled during the present study exhibited darker colourations whilst in more shaded areas.

The larger size classes of mojarras (Gerreidae), and other silvery fish such as jacks (Carangidae) and barracuda (Sphyraenidae) were common in open water areas adjacent to the mangrove. Helfman (1981) suggests that the silvery scales act like a

mirror reflecting the light similar to that which would be transmitted through a transparent object, therefore the fish becomes very difficult to see.

Shade may be important for thermo regulatory control particularly given the extreme conditions experienced in the shallow tidal lagoons of the Bahamas where temperatures may exceed 37°C. The mangrove canopy and root structure also serve another purpose in providing protection from avian predation, from common lagoon inhabitants such as osprey, egrets and heron.

In conclusion, the degree of shade would appear to be the most important factor in attracting fish to the mangrove habitat followed by habitat complexity and then fouling algae biomass. However, variations in preference for these attributes between species and size classes of juveniles would suggest that no single attribute is exclusively responsible for a particular locational preference, and that habitat utilisation is species and/or size class specific. These factors may all contribute to the distribution of juvenile fish within a particular stand of mangrove, but with reference to these findings, areas with greater shade properties are likely to be preferred by most juvenile fish.

In order to clarify the relationship between shade and habitat complexity preferences it was necessary to carry out experiments where shade and root densities could be manipulated in a controlled manner in a setting where predators were present, and vulnerability could be considered as a variable. This was done using artificial mangrove structures.

Chapter 6

Fish Preference in Artificial Mangrove Habitat

6.1 Introduction

It has been hypothesised for many years that mangrove habitats function as nursery areas for juvenile fish, and most studies to date have assumed this function on account of the overwhelming abundance of juvenile fish compared to adults in the mangrove system. Only recently, studies have shown that the utilisation of mangrove root habitat by juvenile reef fish can enhance fish communities and their composition in coral reefs ecosystems (Nagelkerken *et al.* 2002, Mumby *et al.* 2004). As a nursery habitat, the complex structure of the mangrove root system in conjunction with the shade afforded by the tree canopy probably protect juveniles from predation. Helfman (1981) outlined the advantage of shade to fish in predator avoidance where prey can see predators while being less visible themselves.

Observations of fish inhabiting mangrove prop roots in Pigeon Creek lagoon (previous chapter), suggested three possible attributes which may attract fish, a three-dimensional structure, a canopy giving shade, and a food source. However, considering the heterogeneous distribution of juveniles within the mangrove root habitat, and the varying root density and degree of light exclusion, it is not obvious what combinations make the most "preferable" habitat. In the natural mangrove, investigations indicated a correlation between increased shade and root complexity with abundance of juvenile fish. Therefore, more subtle and controlled treatments were carried out using artificially constructed mangrove, to confirm or refute the findings from the natural mangrove prop root system.

Few investigators have carried out artificial manipulations of mangrove roots and canopy in the field, and up until very recently no studies using artificial mangroves

had been carried out in the Caribbean. Laegdsgaard and Johnson (2001) experimented with simple artificial structures in an Australian *Avicennia marina* dominated bay. They worked with three abundant juvenile fish species to determine why juvenile fish utilised the mangrove habitat. Using sticks pushed into the substrate as pneumatophores and shade cloth as canopy they found that their artificial structure attracted slightly more fish than areas with no structure. They found increased species specific utilisation of the structure when food (in the form of epiphytic algae) was allowed to accumulate on the roots, and in the laboratory they found that predation pressure influenced habitat choice.

Cocheret de la Morinière *et al.* (2004) carried out experiments in Curaçao using artificial mangrove structures to determine what attracted juvenile fish to mangrove habitat. They concluded that attractive attributes were species specific but generally both shade and root density were equally and separately important.

In the present study Artificial Mangrove Units (AMUs) were designed and manipulated through a series of experimental treatments to determine species specific preferences for shade and root densities, and to determine if greater isolation from the natural mangrove fringe influenced fish utilisation of the units. AMU unit design and experimental methodology for the present study varied significantly from that of Cocheret de la Morinière *et al.* (2004). Conclusions drawn from this study show that artificial manipulations may have their drawbacks when extrapolating experimental findings to fish populations in natural mangrove habitat.

6.2.1 Construction of artificial mangrove units

Artificial mangrove units (AMUs) were constructed using 3.17 cm schedule 40 PVC pipe, irrigation hose (for roots) and horticultural shade fabric. Overall the units measured 2 m x 2 m and they were constructed as shown below, a full description of AMU construction is presented in Appendix VI.

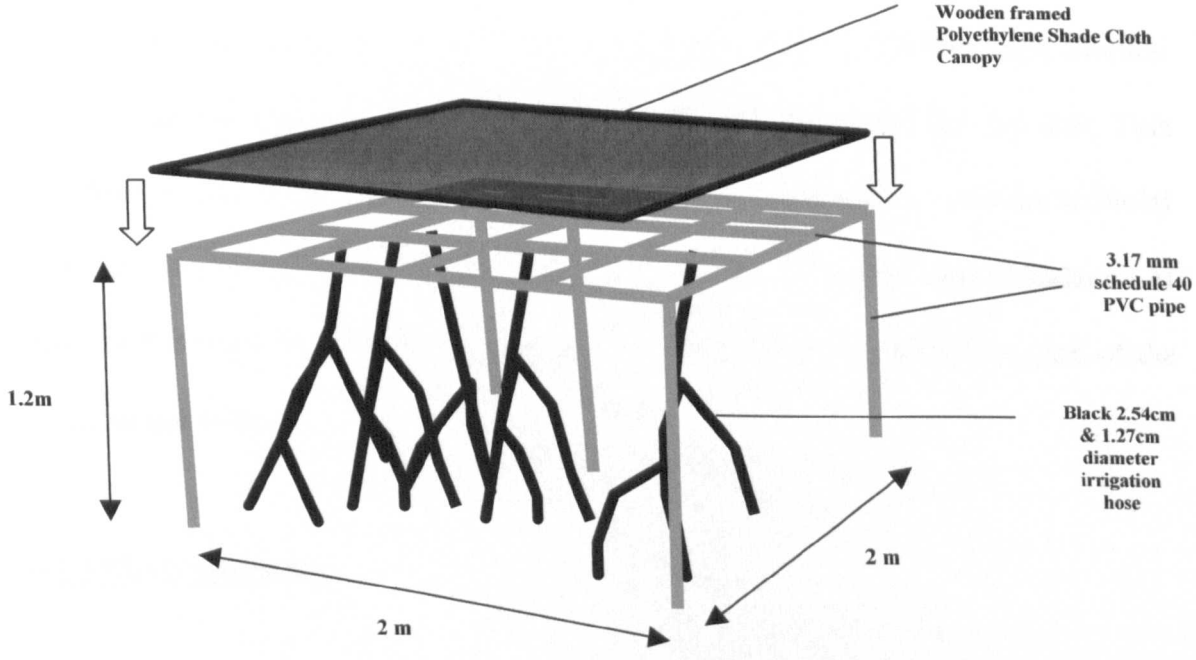


Figure 6.1: Construction of Artificial Mangrove Unit (AMU).

6.2.2 Pilot study

Initial studies were carried out to determine whether juvenile fish would be attracted to the AMUs and whether they had a preference for canopy shade, roots, both shade and roots or neither. Twelve AMU frames were constructed. Three had a canopy of

palm fronds, three had only roots attached (~ 16 roots m^{-2} based on preferred root densities estimated at the time from sampling fish populations in the natural mangrove), three had both canopy and roots, and three units had neither roots nor canopy. One of each type of unit was placed at each of three sample sites. The units were placed in a row parallel to and 2 m from the mangrove fringe in approximately 1 m depth of water (at high tide). The first attempt was destroyed by Hurricane Floyd when some of the units were broken up by the storm, and scattered around the lagoon. The second attempt was successful. Units were allowed to resettle for a number of weeks, following which, sampling was carried out over three days, one day at each site. Every 15 minutes over a 4 hour and 45 minute period (n=20) fish were counted both beneath the AMUs, and in an area 2 m^{-2} located 1 m beyond the last unit. This was done by snorkelling slowly between the natural mangrove fringe and the artificial units and observing fish below the units. The species, size class and abundance of juvenile fish were recorded on a dive slate. This method was repeated for each of the three sample sites.

6.2.3 Shade preference

Following the pilot study, six units were placed at each of two new sample sites, one in the north/south arm (designated as N) and one in the east/west arm (designated as S) of the lagoon (Figure 3.5). These sites were located within the geographical range of sites 1 – 8 where physical conditions were generally uniform. The water depth at each site ranged from 0.75 – 1.2 m and the substrate was bare sand/mud. The first part of the habitat preference experiment concentrated on shade preference. The twelve AMU frames had artificial roots attached at a density of 16 roots m^{-2}, based on

preferred root densities estimated at the time from sampling fish populations in the natural mangrove. At each site each AMU was given a different shade canopy. The control unit had no canopy and the others, had 30%, 51%, 63%, 73% and 90% canopies. Apart from the 90% shade, the other canopy percentage shades were set by manufacturer specifications (Appendix VI). The units were positioned 1 m from and parallel to the mangrove fringe (Figure 6.2) and were spaced approximately 1 – 1.5 m from one another. Sampling was carried out every 30 minutes over a 4.5 hour period (n = 10) between 9.00am and 5.30pm on any given sample day. Counts of juvenile fish were made by snorkeling between the mangrove fringe and the AMUs, to make sure that any fish fleeing to the natural mangrove fringe would be counted.

Figure 6.2: Artificial Mangrove Units (AMUs) positioned in the field parallel to, and approximately 1 m from the natural mangrove fringe, and 1.5 m apart from one another. AMUs were placed on bare substrate to avoid any fish abundance variability that may be cause by the presence of seagrass or other benthic vegetation.

Figure 6.3: Juvenile schoolmaster snappers, *Lutjanus apodus* below an Artificial Mangrove Unit. These fish are approximately 15 - 20 cm in length.

Generally, fish seemed unconcerned by the presence of an observer and it was possible to remain stationary beside the unit for a period of time recording fish species, abundance and size class (Figure 6.3).

Once the first period of sampling was complete, the units were moved further away from the mangroves. They were located in the same order, approximately 3 m from and parallel to the mangrove fringe, and left to settle for six days, then sampled once again. Following this, the canopies were removed from each unit and then reattached in a different order, to reduce any errors that may have been introduced by fish simply swimming to the nearest unit from where they normally rest under the natural mangrove fringe. The site was left to settle and was sampled once again as described above. Following this sampling the units were moved back to 1 m from the mangrove

fringe in the same order, left to settle, then sampled again. The canopies were removed and reattached once more, the units were sampled again after settling and then moved out again to 3 m from the fringe and sampled. This sequence was applied at the other sample site, so, when data from both sites was pooled, six different permutations of shade order occurred (3 at each site replicated at 1m and 3m). Therefore, each canopy shade was sampled sixty times at each site (n = 720) (Appendix IV).

6.2.4 Habitat complexity (root density preference)

Sampling root preference followed a similar methodology to that used for testing shade preference. Preliminary findings from the shade experiment showed a preference by most juvenile fish towards the 90% shade. For testing root density preference, canopy frames with < 90% shade were dismantled and reconstructed with the maximum shade (90%), and attached to all 12 units. With reference to the range of root density values found in the natural mangrove of Pigeon Creek (0 – 45 roots m^{-2}), artificial roots were attached to the AMUs with densities of 10, 20, 30, 40 and 50 roots m^{-2}. The control units had no roots attached. The AMUs were placed randomly 1 m from and parallel to the mangrove fringe (Figure 6.2) and approximately 1 – 1.5 m apart. The units were left to settle and then sampled as described above. Following the first sampling the units were moved in the same order, 3 m from the mangrove fringe, left to settle and sampled again. Following the next sampling the units were moved back to 1 m from the fringe, but were placed in a different order. Sampling continued in the same manner as in the shade experiment, resulting in six root permutations each being replicated twice, once 1m from the fringe and once 3m from the fringe. Each

root density was sampled 60 times (Appendix V) resulting in 720 samples between the two sample sites. Overall 1440 AMU fish counts were made for shade and root preference at the two sites.

6.2.5 Data analysis

Pilot study data was analysed using a series of Mann-Whitney Rank Sum Tests.

Following the main experimental manipulations, both shade and root density fish counts had strongly positively skewed datasets which could not be transformed to a normal distribution for parametric statistical analysis. Mean juvenile fish counts of the 7 most common species (which made up 88% of the total fish count) under each shade treatment, were compared for significance using a Kruskal-Wallis One Way Analysis of Variance on ranks. The same ANOVA was carried out on the 10 most common species (75% of total) under each root density treatment.

Shade preferences of individual species were presented as mean abundance values in histograms with standard error bars, and root density preferences were shown in scatter plots with 3rd order polynomials. Probability values on these plots indicating relationships between fish abundance and experimental treatments were calculated using a Spearman Rank Order Correlation.

6.3 Results

6.3.1 Pilot study

Initial observations clearly showed an attraction to the units and a strong preference at site A and B for units with both roots and canopy (Figure 6.4). Although individually each attribute offered some attraction for juvenile fish, most preferred a habitat with both canopy shade and habitat complexity. Pooled juvenile fish abundances were significantly greater (Mann-Whitney Rank Sum Test $p < 0.001$) under the canopy and root units compared to those under units with roots only or canopy only. There were also significant differences between roots only and canopy only units and also between the canopy only and frame only units. The frame on its own showed little variation in fish abundance from that normally found on the open lagoon bottom. It was concluded that there was no effect on juvenile fish abundance from the presence of the AMU frame ($p = 0.13$), and that the attributes attracting fish to the units were that of shade and habitat complexity (roots). Juvenile fish at site C showed no clear preference for any particular AMU although the roots only units hosted a majority of juveniles. The absence of a clear trend at site C may have been a consequence of the reduced abundance of fish at that site or the presence of species in the counts which had less specific habitat preferences, such as mojarras.

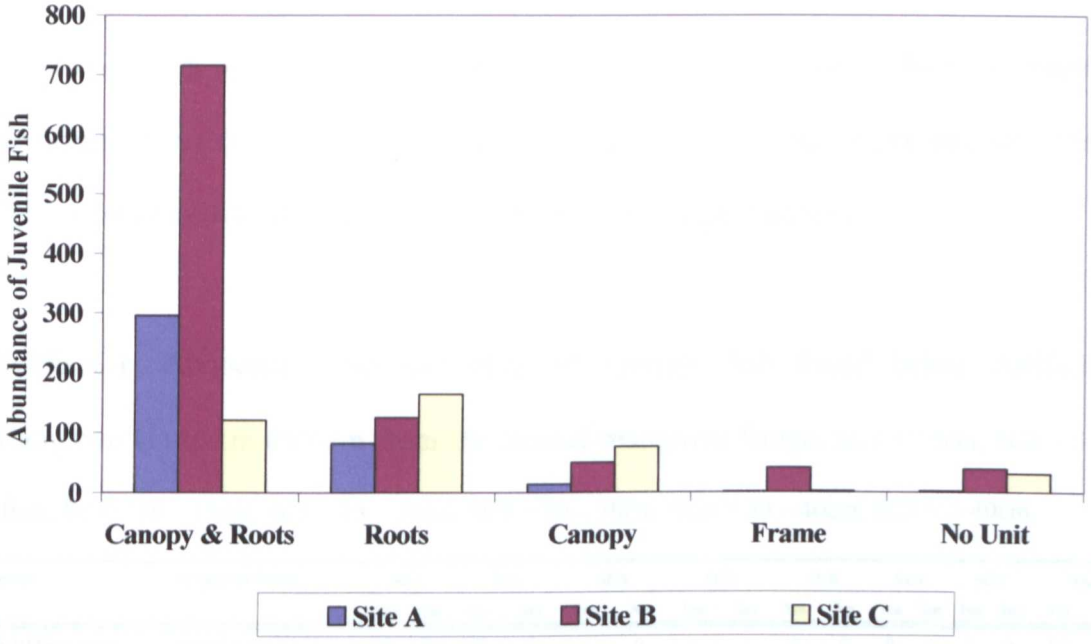


Figure 6.4: Abundance of juvenile fish found below experimental Artificial Mangrove Units with canopy and roots, roots, canopy, frame (control) and no unit treatments.

6.3.2 General AMU utilisation

Table 6.1 summarises the species, size class and abundance of juvenile fish found below the AMUs during this study. In all a total of 22,696 fish from 40 species and 19 families were counted. 12,694 were counted under units 1 m from the natural mangrove fringe and 10,002 from units 3m from the fringe. The greatest variation in numbers between the two distances was most apparent in the smaller size classes of fish (Figure 6.5) probably because movement from the natural fringe to artificial units 3 m from the fringe presented more risk from predation for smaller fish than swimming to units 1 m away. As fish became larger there was less disparity in the numbers of fish between the two distances, perhaps indicating reduced vulnerability to predation. The schoolmaster snapper (*Lutjanus apodus)* of the size classes 10 – 15

and 15 – 20 cm occurred in the greatest numbers below the units. The grey snapper (*Lutjanus griseus*), bluestriped grunt (*Haemulon sciurus*) and bucktooth parrotfish (*Sparisoma radians*) also occurred in comparatively high numbers.

Table 6.1: Abundance and size class of juvenile fish found below Artificial Mangrove Units 1m and 3m from the natural mangrove fringe. SC1 = <5cm, SC2 = 5 – 10cm, SC3 = 10 – 15cm, SC4 = 15 – 20cm, SC5 = 20 – 30cm, SC6 = 30 – 40cm, SC7 = > 40cm.

Species	Common Name	SC1		SC2		SC3		SC4		SC5		SC6		SC7		Total	
		1m	3m	1m	3m	1m	3m	1m	3m	1m	3m	1m	3m	1m	3m	1m	3m
Abudefduf saxatilis	Sergeant Major	73	80	28	4	0	0	0	1	0	0	0	0	0	0	101	85
Acanthurus bahianus	Ocean Surgeon	0	0	2	0	37	104	7	6	0	0	0	0	0	0	46	110
Acanthurus coeruleus	Blue Tang	0	0	0	0	15	8	0	1	0	0	0	0	0	0	15	9
Calamus bajonado	Jolthead Porgy	0	0	0	12	14	127	4	1	0	1	0	1	0	0	18	142
Caranx latus	Horse-eye Jack	0	0	0	0	1	34	0	3	0	0	0	0	0	0	1	37
Caranx ruber	Bar Jack	0	0	2	2	0	0	0	2	0	4	0	0	0	0	2	8
Chaetodon capistratus	Foureyed Butterflyfish	33	2	0	0	0	0	0	0	0	0	0	0	0	0	33	2
Diodon hystrix	Burrfish	0	0	0	0	0	0	0	0	2	1	1	0	0	0	3	1
Epinephelus striatus	Nassau Grouper	0	0	0	0	0	5	5	6	1	0	0	0	0	0	6	11
Eucinostomus jonesi	Slender Mojarra	2	25	216	0	2	0	0	0	0	0	0	0	0	0	220	25
Gerres cinereus	Yellow-fin Mojarra	1	0	79	62	231	179	37	19	1	1	0	0	0	0	349	261
Gnatholepis thompsoni	Goldspot Goby	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Haemulon flavolineatum	French Grunt	0	0	0	0	21	20	12	97	0	0	0	0	0	0	33	117
Haemulon parrai	Sailor's Choice	0	0	0	0	13	9	43	22	6	3	0	0	0	0	62	34
Haemulon plumieri	White Grunt	0	0	0	0	2	8	8	20	0	0	0	0	0	0	10	28
Haemulon sciurus	Bluestriped Grunt	0	0	16	0	820	691	898	741	52	21	0	0	0	0	1786	1453
Halichoeres maculipinna	Clown Wrasse	50	25	14	3	0	0	0	0	0	0	0	0	0	0	64	28
Kyphosus sectatrix	Bermuda Chub	0	0	0	0	0	4	6	6	4	0	0	0	0	0	10	10
Lactophrys triqueter	Smooth Trunkfish	0	0	0	0	0	0	13	2	0	1	0	0	0	0	13	3
Lutjanus analis	Mutton Snapper	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
Lutjanus apodus	Schoolmaster Snapper	0	0	204	2	1946	822	2554	2307	460	557	7	2	0	0	5171	3690
Lutjanus cyanopterus	Cubera Snapper	0	0	0	0	3	0	8	2	4	9	0	0	0	0	15	11
Lutjanus griseus	Grey Snapper	3	0	15	0	527	479	1287	1289	414	706	25	30	0	0	2271	2504
Lutjanus mahogoni	Mahogany Snapper	0	0	0	0	41	2	17	12	0	5	0	0	0	0	58	19
Mulliodichthys martinicus	Yellow Goatfish	0	0	13	9	223	116	80	86	9	6	0	0	0	0	325	217
Myrichthys ocellatus	Goldspotted eel	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Ocyurus chrysurus	Yellowtail Snapper	0	1	31	35	247	127	28	52	2	10	0	0	0	0	308	221
Pomacanthus arcuatus	Gray Angelfish	0	0	0	0	0	1	5	8	0	0	0	0	0	0	5	9
Pomacanthus paru	French Angelfish	0	0	0	0	1	2	14	5	0	0	0	0	0	0	15	7
Pseudupeneus maculatus	Spotted Goatfish	0	0	0	0	1	0	2	1	0	0	0	0	0	0	3	1
Scarus coeruleus	Blue Parrotfish	0	0	0	0	34	11	0	4	0	3	0	0	0	0	34	18
Scarus croicensis	Striped Parrotfish	5	18	323	5	0	0	0	0	0	0	0	0	0	0	328	23
Scarus guacamaia	Rainbow Parrotfish	0	0	0	0	1	1	43	49	158	59	1	4	0	0	203	113
Scarus taeniopterus	Princess Parrotfish	385	109	230	2	16	0	0	0	0	0	0	0	0	0	631	111
Sparisoma radians	Bucktooth Parrotfish	0	0	129	42	255	516	25	50	0	0	0	0	0	0	409	608
Sparisoma viride	Stoplight Parrotfish	2	1	0	0	1	0	1	0	0	0	0	0	0	0	4	1
Sphoeroides testudineus	Checkered Pufferfish	0	0	3	0	0	0	16	2	49	15	0	0	0	0	68	17
Sphyraena barracuda	Great Barracuda	0	0	3	0	3	0	5	2	11	6	1	5	20	9	43	22
Stegastes leucostictus	Beaugregory	3	43	1	2	0	0	0	0	0	0	0	0	0	0	4	45
Thalassoma bifasciatum	Blueheaded Wrasse	0	0	1	0	17	0	5	0	0	0	0	0	0	0	23	0
		559	304	1310	180	4472	3266	5123	4796	1174	1409	35	42	21	9	12694	10002

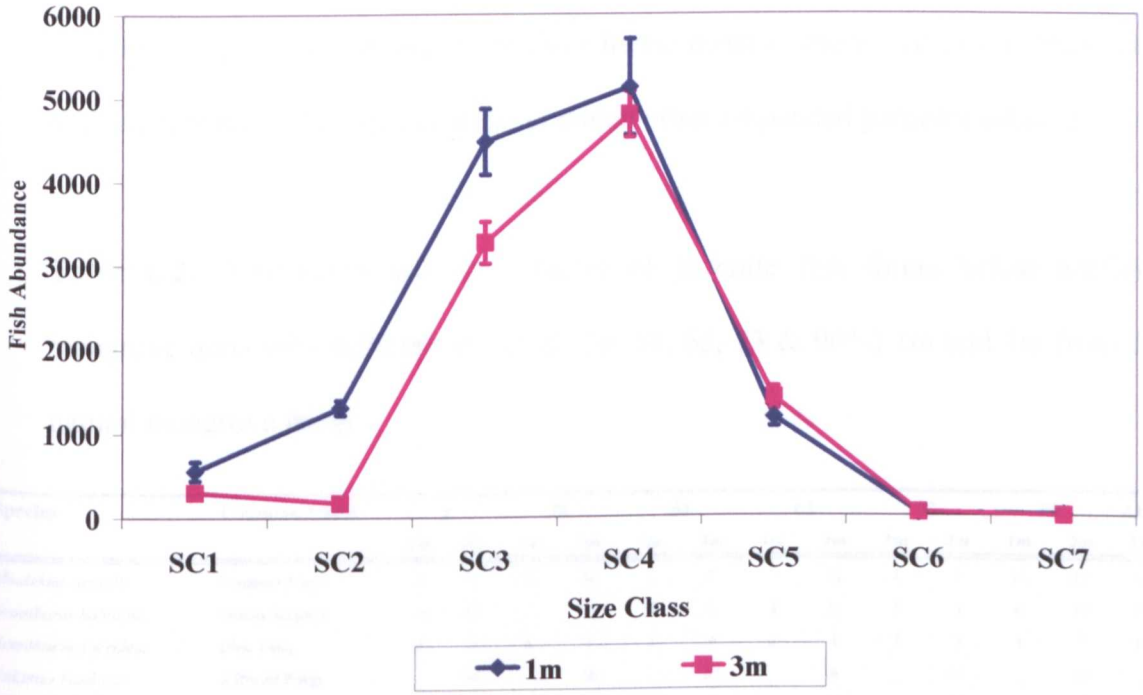


Figure 6.5: Abundance and size class of all species recorded below AMUs 1m and 3m from the natural mangrove fringe. Error Bars = SD

6.3.3 Shade preference

Table 6.2 shows the species, size class and abundance of juvenile fish found below AMUs during canopy shade manipulations. In all 8323 fish from 36 species and 17 families were counted.

Shade manipulations were intended to mimic a variety of canopy shades which may be found in the natural mangrove fringe. Furthermore, the experimental design was such that the shades used increased incrementally to the upper shade value of 90% thereby determining more accurately any shade preferences juvenile fish may have. However, units with 30 and 51% shade became markedly fouled producing shade values similar to 73% (Appendix VII). The reason for this pattern of fouling was not

completely apparent, but larger openings in the mesh of these two fabrics may have trapped calcium carbonate particles, to which other suspended particles adhered.

Table 6.2: Abundance and size classes of juvenile fish found below artificial mangrove units with different shade (0, 30, 51, 63, 73 & 90%) 1m and 3m from the natural mangrove fringe.

Species	Common Name	0		30		51		63		73		90		Abundance	
		1m	3m	1m	3m	1m	3m	1m	3m	1m	3m	1m	3m	1m	3m
Abudefduf saxatilis	Sergeant Major	3	0	25	16	1	7	7	12	4	7	13	12	53	54
Acanthurus bahianus	Ocean Surgeon	1	17	2	19	9	6	4	11	5	4	6	17	27	74
Acanthurus coeruleus	Blue Tang	1	0	6	1	3	1	2	1	2	3	1	3	15	9
Calamus bajonado	Jolthead Porgy	_	26	_	10	_	27	_	6	_	11	_	10	_	90
Caranx latus	Horse-eye Jack	_	0	_	0	_	6	_	0	_	20	_	8	_	34
Eucinostomus jonesi	Slender Mojarra	_	0	_	0	_	0	_	19	_	0	_	0	_	19
Caranx ruber	Bar Jack	0	_	0	_	0	_	0	_	1	_	0	_	1	_
Epinephelus striatus	Nassau Grouper	0	_	0	_	1	_	0	_	0	_	1	_	2	_
Gerres cinereus	Yellow-fin Mojarra	23	28	22	28	49	31	59	12	67	20	14	33	234	152
Gnatholepis thompsoni	Goldspot Goby	0	_	0	_	2	_	0	_	0	_	0	_	2	_
Haemulon flavolineatum	French Grunt	0	1	0	14	3	4	3	8	0	4	11	2	17	33
Haemulon parrai	Sailor's Choice	4	1	13	0	1	6	4	4	2	4	11	2	27	16
Haemulon sciurus	Bluestriped Grunt	18	0	73	49	131	6	78	79	54	32	86	47	440	213
Halichoeres maculipinna	Clown Wrasse	1	0	2	1	0	2	1	0	1	1	3	0	8	4
Kyphosus sectatrix	Bermuda Chub	0	_	1	_	0	_	2	_	0	_	3	_	6	_
Lactophrys triqueter	Smooth Trunkfish	0	0	1	0	1	0	1	1	1	0	1	0	5	1
Lutjanus analis	Mutton Snapper	0	_	0	_	0	_	0	_	1	_	0	_	1	_
Lutjanus apodus	Schoolmaster Snapper	29	2	246	333	486	329	410	171	409	135	650	345	2230	1315
Lutjanus cyanopterus	Cubera Snapper	1	0	6	1	1	0	4	0	0	4	2	3	14	8
Lutjanus griseus	Grey Snapper	10	26	111	244	100	186	203	172	157	111	219	213	800	952
Lutjanus mahogoni	Mahogany Snapper	3	0	9	2	6	0	10	0	9	0	16	1	53	3
Mulloidichthys martinicus	Yellow Goatfish	9	7	31	8	14	13	7	6	16	9	25	8	102	51
Myrichthys ocellatus	Goldspotted eel	0	_	0	_	0	_	0	_	0	_	1	_	1	_
Ocyurus chrysurus	Yellowtail Snapper	2	1	42	4	28	11	15	3	9	7	20	10	116	36
Pomacanthus arcuatus	Gray Angelfish	0	0	0	1	1	2	0	2	4	0	10	1	4	6
Pomacanthus paru	French Angelfish	0	0	0	1	0	0	0	0	0	0	4	1	15	2
Pseudupeneus maculatus	Spotted Goatfish	0	_	1	_	0	_	0	_	0	_	1	_	2	_
Scarus coeruleus	Blue Parrotfish	_	1	_	2	_	3	_	0	_	0	_	1	_	7
Scarus croicensis	Striped Parrotfish	0	0	11	0	0	1	0	0	0	0	13	0	24	1
Scarus guacamaia	Rainbow Parrotfish	41	11	36	5	35	10	26	15	25	6	24	28	187	75
Scarus taeniopterus	Princess Parrotfish	0	0	52	2	4	0	0	0	0	0	11	0	75	2
Sparisoma radians	Bucktooth Parrotfish	32	38	69	63	33	68	26	83	7	56	32	75	199	383
Sphoeroides testudineus	Checkered Pufferfish	1	0	5	1	4	8	26	0	0	0	2	1	38	10
Sphyraena barracuda	Great Barracuda	8	1	6	0	2	0	5	1	3	8	3	1	27	11
Stegastes leucostictus	Beaugregory	1	0	1	12	0	0	1	7	0	8	0	6	3	33
Thalassoma bifasciatum	Blueheaded Wrasse	0	_	0	_	0	_	1	_	0	_	0	_	1	_
		188	160	771	817	915	727	895	613	777	450	1183	828	4729	3594

Fouling was not evident in the 63, 73 and 90% shade cloths (Appendix VII). It would have been impractical to clean sediment from the canopies as regularly as would have been necessary, as sites would have been disturbed introducing a major undesirable and uncontrollable additional factor to the experiment. As shade values for 30, 51 and 73% were essentially the same (within 0.09 log lumens m^{-2}) the fish abundances below these units were pooled, and mean fish abundance values compared to 0, 63 and 90% shades (Figure A7).

Kruskal-Wallis One Way ANOVA on ranks using a pairwise multiple comparison procedure (Dunn's method) on 1m and 3m units indicated that the abundance of fish below the 63, 73 and 90% shade canopies were significantly greater ($p < 0.05$) than that found under no shade units (Table 6.3). There was no significant difference in fish abundances below 63, 73 and 90% canopies. This indicated that a significant level of shade was necessary to attract greater abundances of fish, but once a particular threshold level was reached, in this case 63%, there was no particular preference for varying or greater degrees of shade.

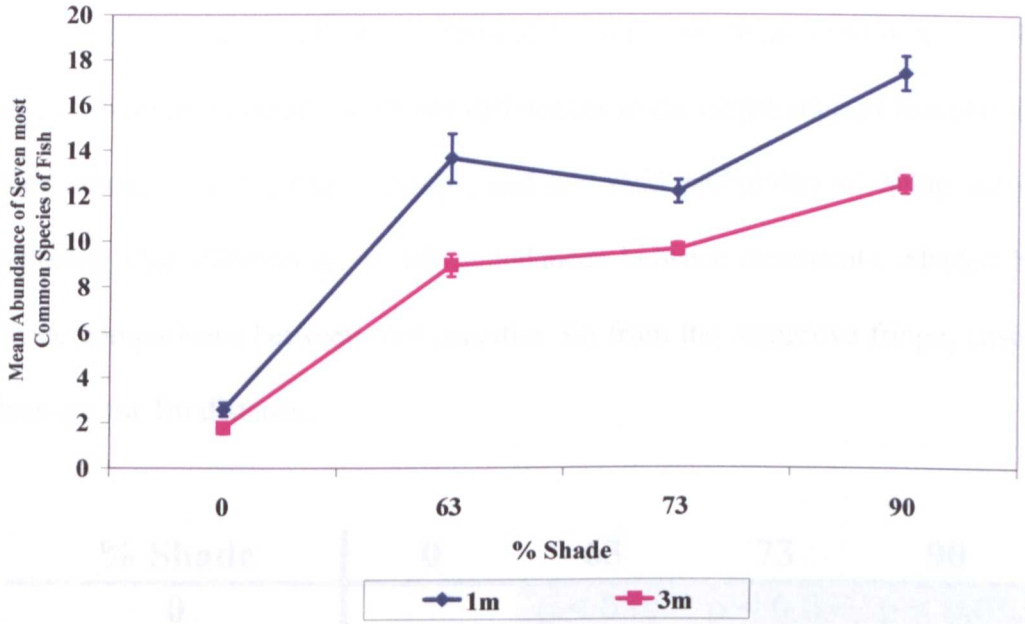


Figure 6.6: Mean abundance of seven most common species of juvenile fish counted below AMUs with different canopy shade 1m and 3m from the natural mangrove fringe. A Kruskal Wallis ANOVA on Ranks indicated that fish abundances below all shades were significantly greater ($p < 0.05$) than that found below zero shade units. However, there were no significant differences in fish abundance between 63, 73 and 90% shades. Error Bars = SE

Table 6.3: Shade preference comparison matrix showing a summary of multiple pairwise comparisons following Kruskal-Wallis One Way ANOVA on Ranks analysis. P-values indicate significant differences in the distribution of fish abundance values between the treatment groups, and a < 0.05 probability of being wrong in concluding true differences in fish abundances between treatments. Shaded boxes indicate comparisons between root densities 3m from the mangrove fringe, unshaded values are for 1m distance.

% Shade	0	63	73	90
0	_	$p < 0.05$	$p < 0.05$	$p < 0.05$
63	$p < 0.05$	_	ns	ns
73	$p < 0.05$	ns	_	ns
90	$p < 0.05$	ns	ns	_

6.3.4 Habitat complexity (root density preference)

Data from root density manipulations are shown in Table 6.4. In total 14,373 fish from 37 species and 17 families were counted. For AMUs located 1m from the mangrove fringe there was no significant difference in fish abundances under units with $\geq$ 20 roots m^{-2}, but abundances under these units did vary significantly from those with 0 and 10 roots m^{-2}. At a 3m distance, fish abundance values did not vary significantly below AMUs with root densities $\geq$ 30 roots m^{-2} (Table 6.5). This indicated that there is a preference for a degree of habitat complexity, in this case at least 20 roots m^{-2} under units 1m from the natural mangrove fringe and at least 30 roots m^{-2} 3 m from the fringe. However, once these levels of complexity were reached

a further increase or variation in root density did not significantly affect the distribution of juvenile fish (Figure 6.7).

Table 6.4: Abundance and size classes of juvenile fish found below artificial mangrove units with different root density (0, 10, 20, 30, 40, & 50 roots m^{-2}) 1m and 3m from the natural mangrove fringe.

Species	Common Name	0		10		20		30		40		50		Abundance	
		1m	3m	1m	3m	1m	3m	1m	3m	1m	3m	1m	3m	1m	3m
Abudefduf saxatilis	Sergeant Major	0	0	1	4	7	1	14	3	11	8	15	15	48	31
Acanthurus bahianus	Ocean Surgeon	0	0	8	1	2	9	5	3	3	13	1	10	19	36
Calamus bajonado	Jolthead Porgy	0	10	4	4	3	19	0	2	9	7	2	10	18	52
Caranx latus	Horse-eye Jack	0	1	0	1	1	0	0	1	0	0	0	0	1	3
Caranx ruber	Bar Jack	0	0	0	0	0	0	1	7	0	0	0	1	1	8
Chaetodon capistratus	Foureyed Butterflyfish	0	0	0	2	11	0	1	0	12	0	9	0	33	2
Diodon hystrix	Burrfish	0	0	0	0	2	0	0	1	1	0	0	0	3	1
Epinephelus striatus	Nassau Grouper	0	0	0	0	0	2	2	7	2	1	0	1	4	11
Eucinostomus jonesi	Slender Mojarra	0	0	87	0	75	0	54	0	0	0	4	6	220	6
Gerres cinereus	Yellow-fin Mojarra	27	48	41	23	18	14	4	10	13	2	12	12	115	109
Haemulon flavolineatum	French Grunt	0	0	0	1	0	10	14	55	0	7	2	11	16	84
Haemulon parrai	Sailor's Choice	0	0	0	2	8	4	7	2	14	10	6	0	35	18
Haemulon plumieri	White Grunt	0	1	0	0	0	3	2	13	7	7	1	4	10	28
Haemulon sciurus	Bluestriped Grunt	0	0	39	27	172	100	559	611	262	208	314	294	1346	1240
Halichoeres maculipinna	Clown Wrasse	0	0	0	2	1	3	25	9	2	0	28	10	56	24
Kyphosus sectatrix	Bermuda Chub	0	0	0	2	2	2	1	0	1	5	0	1	4	10
Lactophrys triqueter	Smooth Trunkfish	0	0	0	0	0	0	0	0	0	0	8	2	8	2
Lutjanus analis	Mutton Snapper	_	0	_	0	_	1	_	0	_	0	_	0	_	1
Lutjanus apodus	Schoolmaster Snapper	3	0	36	7	322	204	845	354	963	1011	772	799	2941	2375
Lutjanus cyanopterus	Cubera Snapper	0	0	1	0	0	0	0	2	0	1	0	0	1	3
Lutjanus griseus	Grey Snapper	12	1	57	17	195	206	366	335	382	575	459	418	1471	1552
Lutjanus mahogoni	Mahogany Snapper	0	0	0	0	0	7	1	6	2	1	2	2	5	16
Mulliodichthys martinicus	Yellow Goatfish	9	2	20	14	54	51	82	36	43	36	15	27	223	166
Ocyurus chrysurus	Yellowtail Snapper	10	9	22	36	16	36	41	43	40	24	63	37	192	185
Pomacanthus arcuatus	Gray Angelfish	0	0	0	0	0	0	1	3	0	0	0	0	1	3
Pomacanthus paru	French Angelfish	_	0	_	0	_	0	_	0	_	0	_	5	_	5
Pseudupeneus maculatus	Spotted Goatfish	0	0	0	0	0	0	1	0	0	0	0	1	1	1
Scarus coeruleus	Blue Parrotfish	0	0	9	0	10	1	10	6	5	3	0	1	34	11
Scarus croicensis	Striped Parrotfish	0	0	0	2	0	5	35	12	142	3	127	0	304	22
Scarus guacamaia	Rainbow Parrotfish	0	0	5	7	5	14	1	8	1	5	4	4	16	38
Scarus taeniopterus	Princess Parrotfish	0	0	125	0	212	0	98	48	58	0	63	61	556	109
Sparisoma radians	Bucktooth Parrotfish	1	9	31	11	52	49	63	50	36	52	27	54	210	225
Sparisoma viride	Stoplight Parrotfish	0	0	0	0	0	0	0	1	1	0	3	0	4	1
Sphoeroides testudineus	Checkered Pufferfish	0	1	5	0	17	0	2	5	0	1	6	0	30	7
Sphyraena barracuda	Great Barracuda	5	3	0	4	9	3	0	0	2	1	0	0	16	11
Stegastes leucostictus	Beaugregory	0	0	0	2	0	0	1	8	0	2	0	0	1	12
Thalassoma bifasciatum	Blueheaded Wrasse	0	_	3	_	2	_	13	_	3	_	1	_	22	_
		67	85	494	169	1196	744	2249	1641	2015	1983	1944	1786	7965	6408

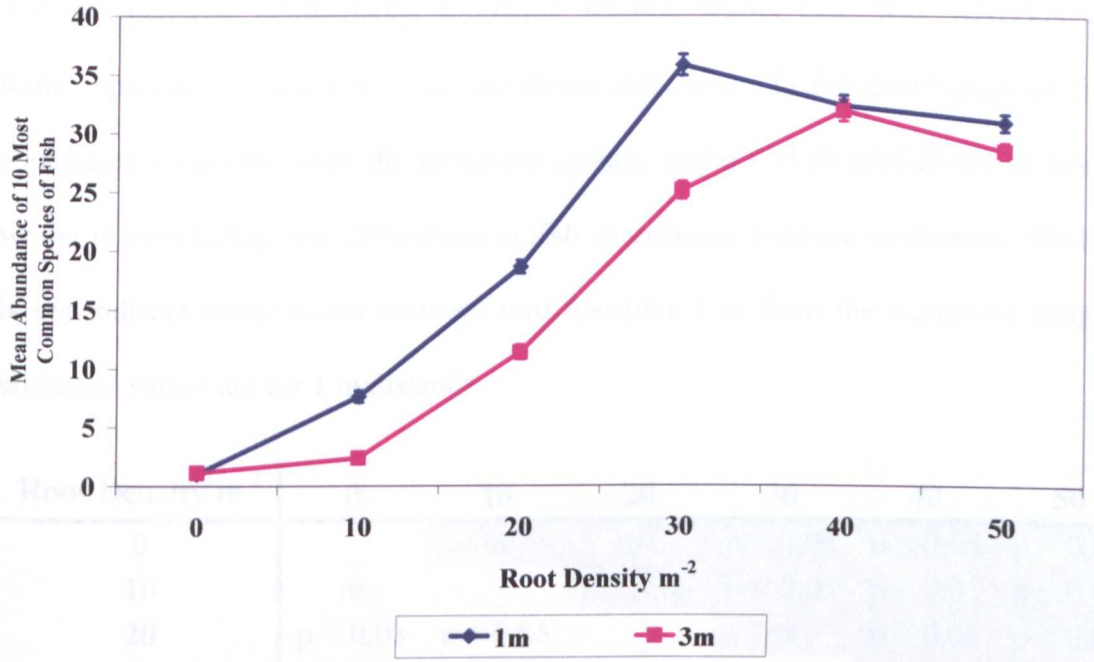


Figure 6.7: Mean abundance of juvenile fish counted below AMUs with different root density 1m and 3m from the natural mangrove fringe (n = 60 at each distance for each root density). Error Bars = SE.

Table 6.5: Root density preference comparison matrix showing a summary of multiple pairwise comparisons following Kruskal-Wallis One Way ANOVA on Ranks analysis. P values indicate significant differences in the distribution of fish abundance values between the treatment groups, and a < 0.05 probability of being wrong in concluding true differences in fish abundances between treatments. Shaded boxes indicate comparisons between root densities 3 m from the mangrove fringe, unshaded values are for 1 m distance.

Root Density m^{-2}	0	10	20	30	40	50
0	_	ns	ns	$p < 0.05$	$p < 0.05$	$p < 0.05$
10	ns	_	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p < 0.05$
20	$p < 0.05$	$p < 0.05$	_	ns	$p < 0.05$	$p < 0.05$
30	$p < 0.05$	$p < 0.05$	ns	_	ns	ns
40	$p < 0.05$	$p < 0.05$	ns	ns	_	ns
50	$p < 0.05$	$p < 0.05$	ns	ns	ns	_

The distribution of different size classes of *Lutjanus apodus*, *L. griseus, Ocyurus chrysurus*, *Haemulon sciurus* and *Gerres cinereus* were graphed (Figures 6.8 & 6.9). There was clear variation in size class distribution for the snappers, and the bluestriped grunts, with larger size classes of juveniles utilising AMUs further from the natural mangrove fringe. Mojarra, *Gerres cinereus,* and the snapper *Ocyurus chrysurus* showed no size class variability with distance although numbers of both were greater under the 1 m units. So, within some species, specifically those which are common in high numbers under natural mangrove, there appears to be a preference by smaller individuals to stay closer to the natural mangrove fringe where there is more opportunity for escape should the fish be pursued by a predator.

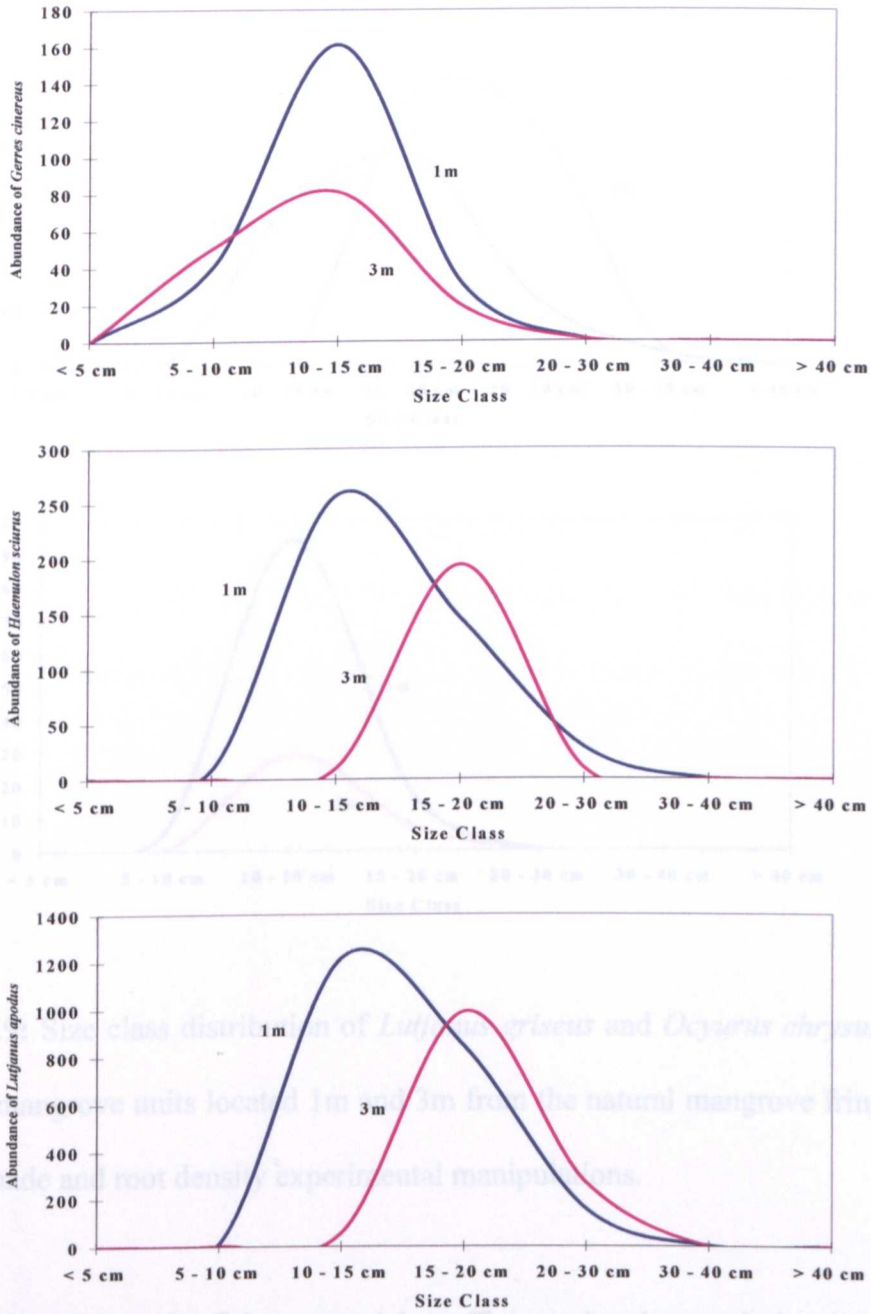


Figure 6.8: Size class distribution of *Gerres cinereus*, *Haemulon sciurus* and *Lutjanus apodus*, under artificial mangrove units located 1m and 3m from the natural mangrove fringe during canopy shade and root density experimental manipulations.

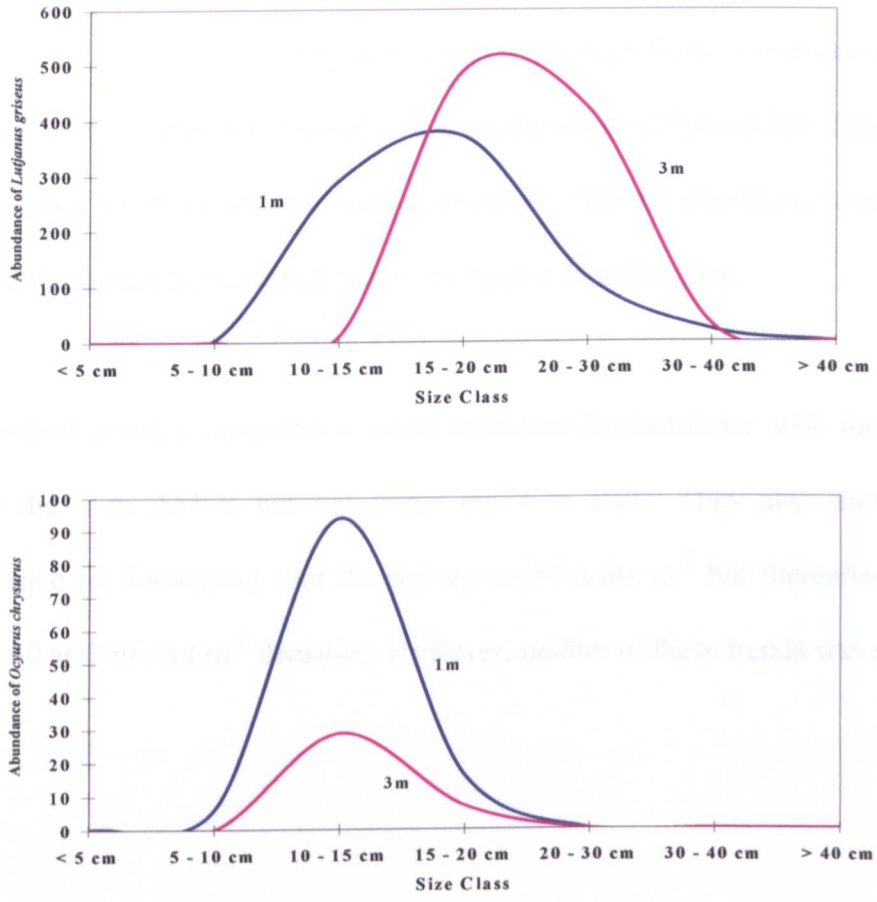


Figure 6.9: Size class distribution of *Lutjanus griseus* and *Ocyurus chrysurus* under artificial mangrove units located 1m and 3m from the natural mangrove fringe during canopy shade and root density experimental manipulations.

Four species of juvenile fish occurred in sufficient abundances during both canopy shade and root density manipulation experiments to identify species-specific preferences for particular shade and habitat complexity.

Abundances of juvenile *Gerres cinereus* showed no significant correlation with increasing shade. This was perhaps because Gerreids are normally found in open water above sand/mud and seagrass habitat. Their colouration enables juveniles to avoid predation in these open habitats, therefore the necessity to utilise mangrove

habitat is limited. Indeed, the root density graph suggests no particular preferences under units 1 m from the mangrove fringe and a significant reduction in numbers of Gerreids as root density increased 3 m from the fringe (Figure 6.10). This trend would be expected for this particular species as silvery fish are also likely to standout more against the darker background created by higher root densities.

Bluestriped grunt, (*Haemulon sciurus*) increased in abundance with increased shade under the 1 m AMUs but not under the 3 m units. They also showed a slight preference for increasing root density up to 30 roots m^{-2} but thereafter were fewer under 40 and 50 root m^{-2} densities. However, neither of these trends was significant.

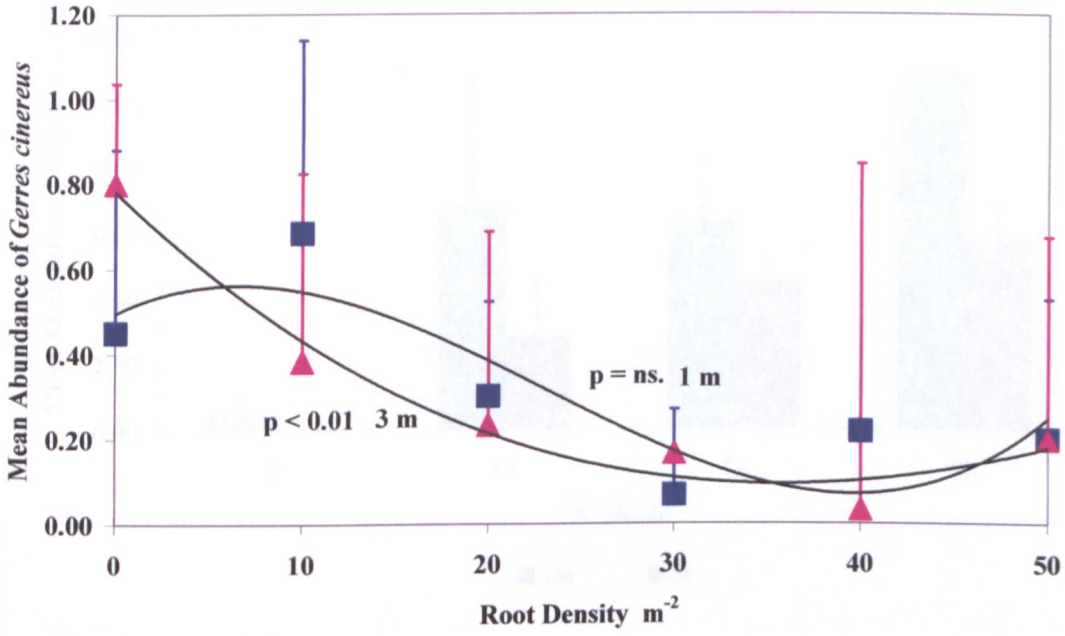


Figure 6.10: Mean abundance of *Gerres cinereus* recorded under artificial mangrove units plotted against % shade and root density (m^{-2}). ■ indicates abundance values recorded 1m from the mangrove fringe, ▲ indicates those recorded 3m from the natural mangrove fringe. Trendlines for root density are 3rd order polynomials. Probability values were calculated using a Spearman Rank Order Correlation. ns = non significant, Error bars = SE

Both *L. apodus* and *L. griseus* (Figure 6.11 & 6.12) showed significant increases in mean abundance under the 1 m units as shade increased, however abundances in neither species were affected by canopy shade under units 3 m from the mangrove fringe. Both species increased significantly with increased root density. For *L. apodus* the greatest abundances occurred below units with 40 roots m^{-2} while *L. griseus* preferred 40 or 50 roots m^{-2} depending on distance from the natural fringe.

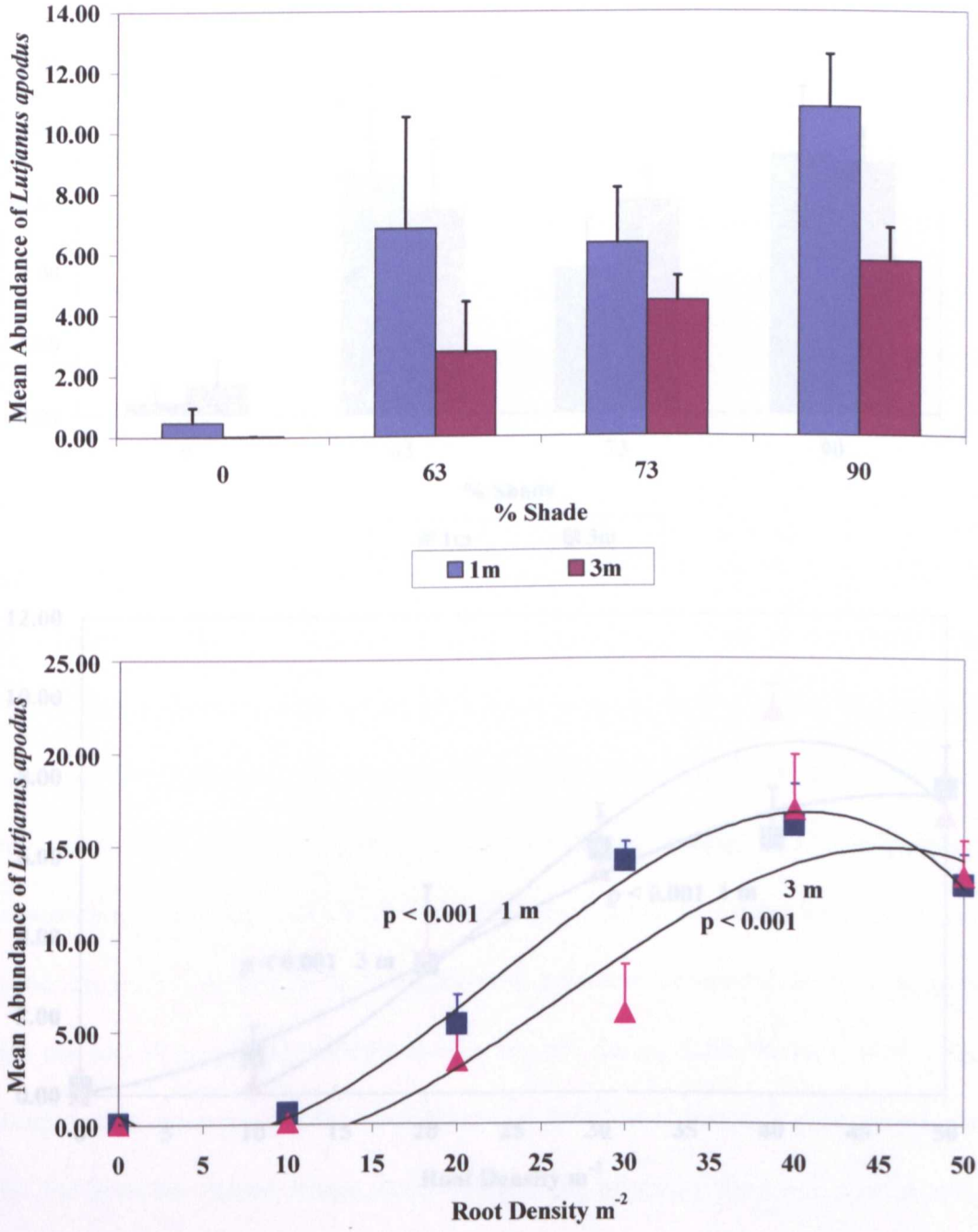


Figure 6.11: Mean abundance of *Lutjanus apodus* recorded under artificial mangrove units plotted against % shade and root density (m^{-2}). ■ indicates abundance values recorded 1m from the mangrove fringe, ▲ indicates those recorded 3m from the natural mangrove fringe. Trendlines for root density are 3rd order polynomials. Probability values were calculated using a Spearman Rank Order Correlation. ns = non significant, Error bars = SE

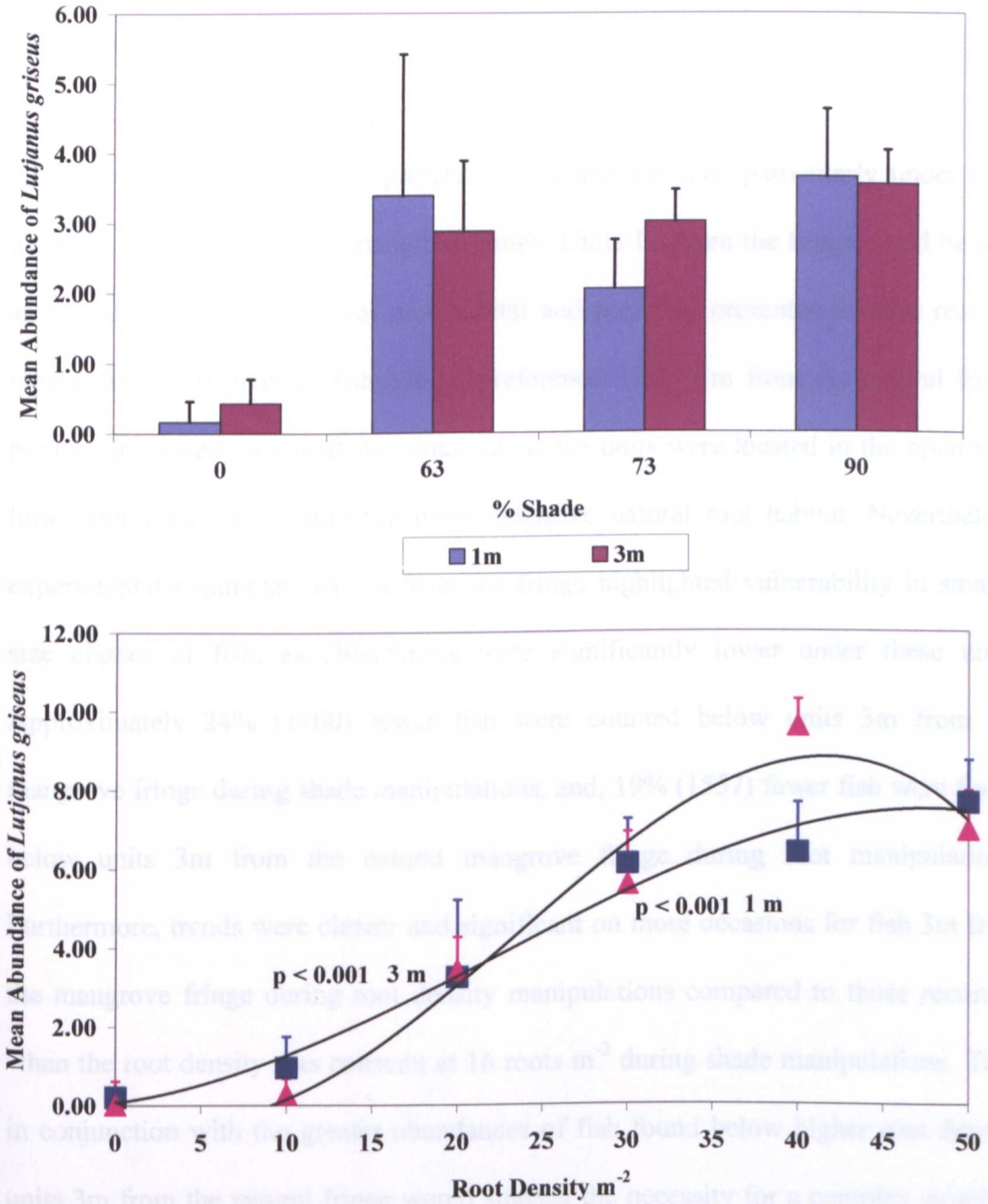


Figure 6.12: Mean abundance of *L. griseus* recorded under artificial mangrove units plotted against % shade and root density (m^{-2}). ■ indicates abundance values recorded 1m from the mangrove fringe, ▲ indicates those recorded 3m from the natural mangrove fringe. Trendlines for root density are 3rd order polynomials. Probability values were calculated using a Spearman Rank Order Correlation. ns = non significant, Error bars = SE

6.4 Discussion

Clear trends indicated habitat preferences by juvenile fish, particularly under units located 1m from the natural mangrove fringe. Units 1m from the fringe could be seen as an extension of the natural root habitat and probably presented a more realistic representation of juvenile fish habitat preference. Units 3m from the natural fringe perhaps presented an unrealistic situation, as the units were located in the open with little option for escape into the more extensive natural root habitat. Nevertheless, experimental manipulations 3m from the fringe highlighted vulnerability in smaller size classes of fish, as abundances were significantly lower under these units. Approximately 24% (1100) fewer fish were counted below units 3m from the mangrove fringe during shade manipulations, and, 19% (1557) fewer fish were found below units 3m from the natural mangrove fringe during root manipulations. Furthermore, trends were clearer and significant on more occasions for fish 3m from the mangrove fringe during root density manipulations compared to those recorded when the root density was constant at 16 roots m^{-2} during shade manipulations. This, in conjunction with the greater abundances of fish found below higher root density units 3m from the natural fringe would suggest the necessity for a complex structure when fish may be more vulnerable to predation.

During root manipulations the abundances of snappers peaked at intermediate root densities. After a certain root density, adequate protection from predation was reached and there was no discernible significant variation in fish utilisation of the units. The absence of significant variation under more densely rooted units may be a consequence of schooling behaviour. Juvenile fish find safety in numbers and small

schools of fish below the AMUs may have quickly increase to larger schools subsequently overflowing into other units. There is the possibility that this phenomena occurred more readily under units 3m from the natural mangrove fringe, as given the opportunity, juvenile fish may have been more likely to spread into adjacent units as opposed to swimming across open water back to the natural mangrove fringe. However, it is unlikely that schooling was greatly significant in biasing results as the location of units with different root densities and canopy shades were changed before each set of surveys therefore higher root density units did not necessarily neighbour one another. In addition, a high number of replicate samples were performed which presumably evened out any bias.

Juveniles below the experimental units were not attracted by the presence of food in the form of epiphytic algae. Algae epiphyte growth under each of the artificial units was very similar as shade canopies were changed between units during experimental shade manipulations, and were constant at 90% shade during root manipulations allowing for similar light penetration below the units and therefore similar algal growth. It would have been impractical and potentially destructive to the sample sites to clean the artificial roots as much as would have been necessary to keep them clear of epiphytic growth. Therefore, algae were allowed to colonise the roots whilst being monitored for any unequal growth between units.

Size class variability within species was more limited in the artificial habitat, and it was not possible to compare root and shade preferences between size classes. The AMUs did have their limitations for determining habitat preferences of juvenile fish. For example, species composition and proportional abundances of each species varied

significantly between the natural mangrove and the artificial units (see Tables 4.1 and 6.1). In addition to this, the proportion of each size class of juvenile fish under the artificial units was almost the opposite of that found under in the natural mangrove (Figure 6.13), with fewer numbers of small size class individuals and greater numbers in larger size classes.

Sample sites were selected that had no coverage of seagrass. Consequently, some species of fish may have been absent, or in fewer numbers below the units because of the lack of seagrass adjacent to or under the units. Seagrass was often common around the mangrove root fringe in natural mangrove habitat and may have provided additional protection for smaller individuals. However, the experimental design in the present study aimed to avoid any behavioural affect occurring due to the presence of seagrass by omitting this as a variable.

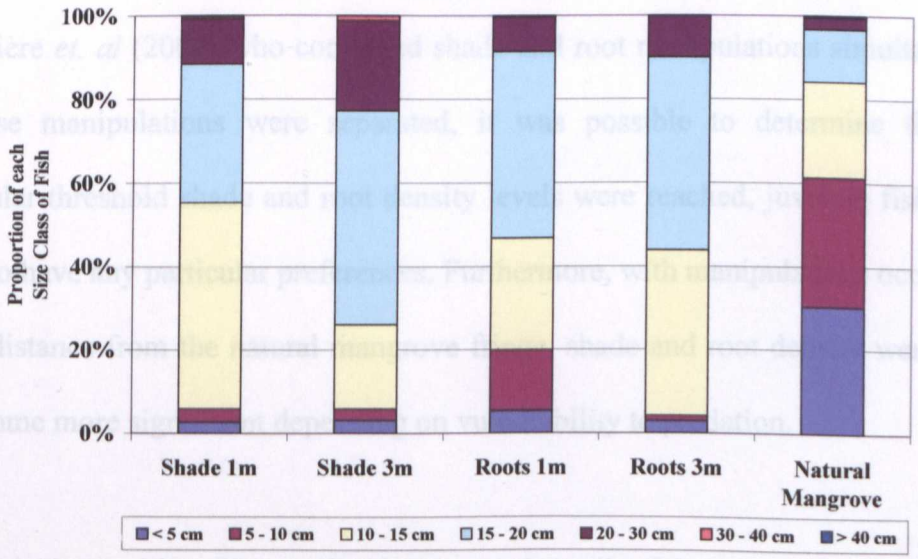


Figure 6.13 The percentage of each size class of juvenile fish found under AMUs 1m and 3m from the mangrove fringe during experimental shade and root manipulations, compared to size classes found in the natural mangrove habitat.

Finally, species which are known to accumulate around artificial fish attracting devices in the wild, such as snapper and grunt probably monopolised the artificial units discouraging smaller fish which would potentially become prey under the units. Furthermore, snappers and grunts occurred in such large schools that the amount of space available for other species was limited.

These findings support those of Cocheret de la Morinière *et al.* (2004). Both shade and root density were demonstrated to be important attributes in attracting juvenile fish to mangrove root habitat. In the present study, greater abundances, and many more species of fish were attracted to the AMUs. Furthermore, the larger units used in this study and the high number of sample replicates identified subtle changes in habitat utilisation. Experimental manipulations in the present study were carried out for shade and then for root density separately, keeping the other constant. This experimental design was a different approach than that used by Cocheret de la Morinière *et. al* (2004) who combined shade and root manipulations simultaneously. Because manipulations were separated, it was possible to determine that once particular threshold shade and root density levels were reached, juvenile fish did not seem to have any particular preferences. Furthermore, with manipulations occurring at a 3m distance from the natural mangrove fringe, shade and root density were shown to become more significant depending on vulnerability to predation.

In conclusion, within Pigeon Creek lagoon, juvenile fish commonly found below mangroves require habitat with both shade and root complexity, although the preferred degree of shade and root density varies between species. Fish prefer a mangrove canopy with greater shade up to a point, after which further shade, results

in little change in fish abundance. This is also species-specific. Juvenile fish prefer habitat with a more complex root system, again up to a point, which varies according to vulnerability. When a certain root density is reached abundances peak or even then drop off.

Fewer, but larger size classes of fish utilised the artificial mangrove units 3 m away from the mangrove fringe. This suggested that smaller size classes were perhaps more vulnerable to predation further from the natural fringe, and that fish make a choice to avoid the 3 m swim to the units, or determine that escape to the natural fringe across the 3 m gap is too risky.

Chapter 7

General Discussion and Conclusions

7.1 Factors affecting juvenile fish distributions

From the present study, and numerous others, it is clear that red mangrove prop root habitat plays an important role in the life cycle of juvenile reef fish, providing a rich food source (Parrish 1989, Laegdsgaard and Johnson 2001), and protection against predation (Thayer *et al.* 1987, Robertson and Duke 1987, Laegdsgaard and Johnson 1995, Nagelkerken *et al.* 2000a, Mumby *et al.* 2004) . The utilisation of complex habitats such as mangrove, macroalgae, seagrass and salt marsh is fundamental to optimising growth and reducing the chances of mortality in the early life stages of many marine organisms (Irlandi and Crawford 1997, Dahlgren and Eggleston 2000, Nagelkerken and van der Velde 2002).

Generally, at large spatial scales reef fish larvae will be passively transported towards the coast from spawning sites, in ocean gyres or tidal currents. Larvae are also able to migrate vertically in the water column to take advantage of stratified inshore currents. (Norcross and Shaw 1984, Boehlert and Mundy 1988). To optimise transportation to suitable inshore nursery habitat, spawning sites are often located close to areas of oceanic upwelling, or gyral currents (Norcross and Shaw 1984). However, once larvae are in range of preferred coastal habitats, active behaviour often takes over. Some larvae are capable of swimming great distances (Montgomery *et al.* 2001), and others will actively "ride" surface currents on incoming tides or take advantage of longshore drift to find suitable habitat. There are a number of cues which may indicate to fish larvae the proximity and direction to preferred habitat; these include water temperature, salinity, water stratification, turbidity, riverine discharge, weather patterns and water flow patterns. These cues along with others have been reviewed by

Boehlert and Mundy (1988), who concluded that a number of physical factors working together may be necessary as stimuli to direct fish larvae towards estuarine habitats. It is clear that more research is needed on what directs larvae towards coastal habitats, in particular in tropical tidal lagoons where there is no freshwater influence. Other possible stimuli include strong temperature and salinity gradients, and variable concentrations of dissolved organic matter and particulates.

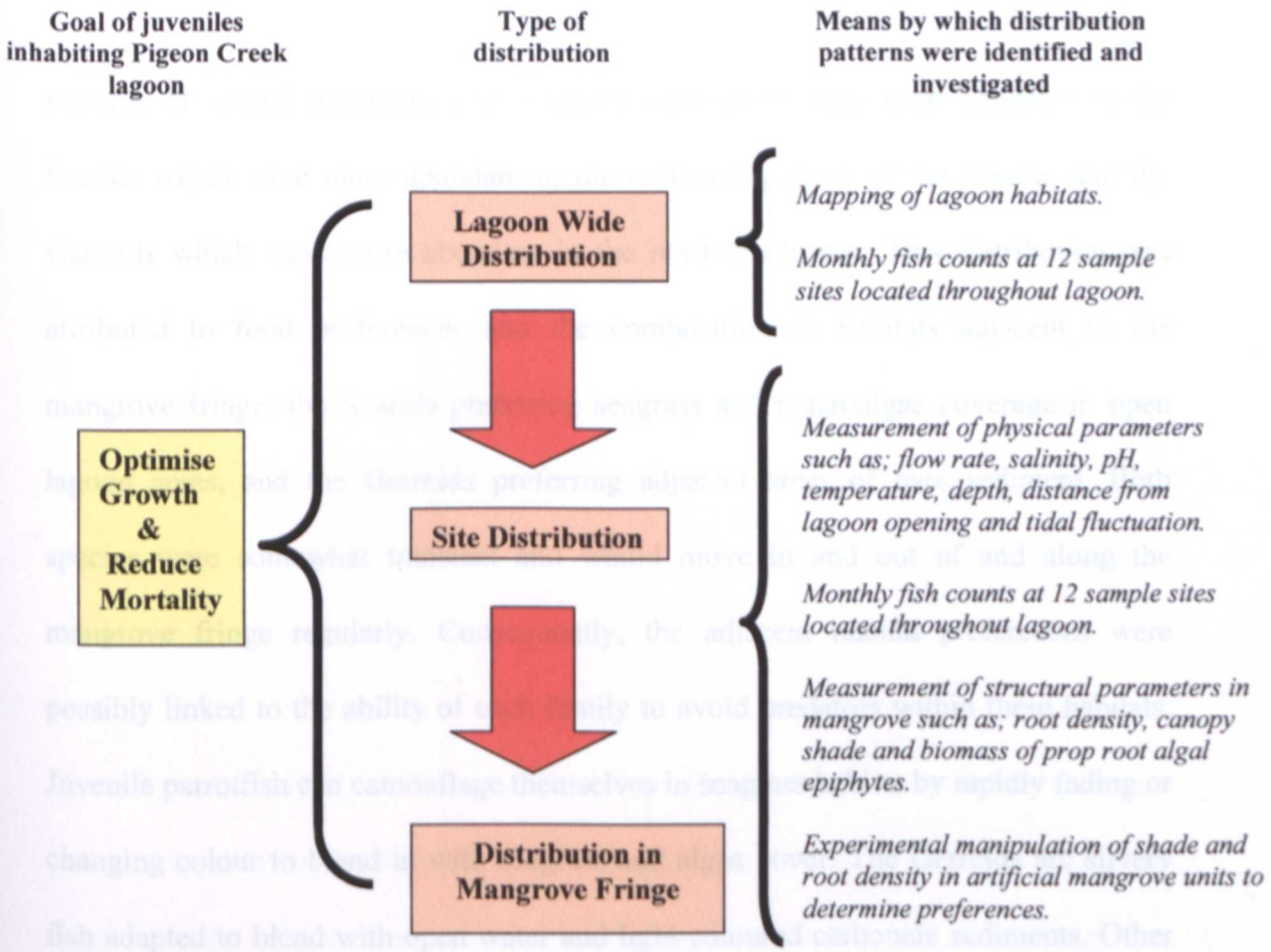


Figure 7.1: The spatial scales at which various distributions of different species of juvenile reef fish were evident, and the sampling methods used to determine the reasons for these distributions.

The differentiation between stochastic and active recruitment to mangrove habitat is fundamental to determining if habitat utilisation is selective. Through the sampling methodology used in this study, the utilisation of red mangrove habitat in Pigeon Creek could be viewed at various spatial scales (Figure 7.1), allowing the concept of selective habitat utilisation to be shown.

7.2 Lagoon-wide distribution

Patterns of spatial distribution at a lagoon-wide scale were most apparent in the Scarids which were more abundant in the east/west portion of the lagoon, and the Gerreids which were more abundant in the north/south arm. This distribution was attributed to food preferences and the composition of habitats adjacent to the mangrove fringe, the Scarids preferring seagrass and macroalgae coverage in open lagoon areas, and the Gerreids preferring adjacent areas of bare sediment. Both species were somewhat transient and would move in and out of and along the mangrove fringe regularly. Consequently, the adjacent habitat preferences were possibly linked to the ability of each family to avoid predators within these habitats. Juvenile parrotfish can camouflage themselves in seagrass habitat by rapidly fading or changing colour to blend in with seagrass and algae cover. The Gerreids are silvery fish adapted to blend with open water and light coloured carbonate sediments. Other studies have shown that adjacent habitat composition can play a significant role in optimising survival. In intertidal salt marshes adjacent to seagrass beds, pinfish were twice as abundant compared to sites with unvegetated adjoining habitat, and, in enclosures pinfish were up to 90% heavier at sites with adjacent vegetated habitat compared to those without (Irlandi and Crawford 1997).

In Pigeon Creek, patterns of distribution were seen for the Lutjanids, Haemulids and Pomacentrids which were found in greater abundances at sites around the lagoon opening and in the mid portion of the north/south arm.

The influences which allow larvae to navigate towards suitable habitat are poorly understood, but given the mechanisms of larval transportation which are already known, it is quite possible that larvae entering Pigeon Creek are capable of showing selective habitat preferences. The lagoon-wide distribution of Gerreids and Scarids in Pigeon Creek may occur at a larval stage. Post settlement movement of these juvenile fish to preferred habitat across other habitats, which may provide limited shelter, could be too risky. Indeed, the choice of preferred habitat by fish larvae in this case may be adaptive behaviour, a theory supported by Bell and Westoby (1986) who suggested that there should be selection against juvenile fish that have a dependence on crypsis amongst seagrass leaving this habitat after settlement.

7.3 Site distribution

The distribution of juvenile fish species varied considerably between the sample sites. The supply of larvae to the lagoon undoubtedly played a role in this, as sites furthest away from the lagoon opening tended to harbour fewer individuals. Analysis of data in this study suggested that distance from the lagoon opening was only a limiting factor beyond a certain distance (between 2.35 – 2.98 km) from the lagoon opening. However, recruitment to mangrove habitat within these distances although statistically insignificant, was still quite uneven with higher abundances of fish recorded at a majority of the sites from the channel opening up to the mid north/south arm of the

lagoon. The abundance of juvenile fish in this area (sites 4 – 8) contrasted with sites in the upper reached of the east/west arm, although they were similar distances from the lagoon opening. This may have been a result of the volume and velocity of water entering and exiting each arm of the lagoon. The data showed that sites with higher flow rates measured 3 metres from the mangrove fringe harboured more individuals, supporting the hypothesis that larval supply may be partly responsible for the variable distribution of fish. Furthermore, through surveys and experimental manipulations, it was determined that juveniles preferred to utilise habitat with greater shade properties ($\geq$ 63%) and root densities ranging from 18 roots m^{-2} in natural mangrove to at least 20 - 30 roots m^{-2} in artificial mangrove units. Many sites providing suitable shelter were under-utilised, supporting the theory that tidal currents played an important role in the localised aggregation of fish.

Similar trends have been found in other marine species. Stoner (2003) identified three primary nursery areas for *Strombus gigas*, the queen conch, which were distinguished by distinct tidal flow. Aggregations were found in the same general location year after year. Furthermore, Pomacentrids in One Tree Lagoon on the Great Barrier Reef showed consistently high recruitment over decades at particular sample sites due to physical oceanographic processes (Booth *et al.* 2000).

Another factor which may have contributed to the reduced number of juveniles at some sites in the east/west arm of the lagoon may have been pre-settlement mortality. Compared to the north/south arm, planktonic larvae would potentially have to swim or drift above extensive areas of seagrass and macroalgae for comparatively long periods of time before reaching mangrove fringe habitat because of the high coverage

of benthic vegetation, and slower water flow rates. This would make larvae vulnerable to ambush by predators sheltering in the vegetative cover.

In Pigeon Creek, the sites which were inhabited by the greatest number of juveniles had similar characteristics, they were exposed to moderate to high tidal currents, and they were isolated patches of mangrove as opposed to continuations of the coastal fringe. Mullin (1990) suggested that isolated overwash island sites may harbour comparatively higher abundances of juvenile fish because of an edge effect. Large isolated stands of mangrove have a greater fringe length than the same area of mangrove in the coastal fringe, thus there is an increased probability of larvae or juveniles coming across the mangrove 'island'. These sites also existed in relative isolation and it was hypothesised that as juveniles grow and begin to school, individuals are less likely to put themselves at risk seeking alternative mangrove habitat, therefore fish counts remained fairly consistent throughout the study period at these sites. Moreover, at these high abundance sites, repeated observations were made of identifiable individuals over an extended period, supporting the theory that some juveniles inhabit a particular site for extended periods of time. This may not be unusual, as other studies have shown that some juvenile fish have restricted movement (Irlandi and Crawford 1997, Tupper and Boutilier 1997). It is also feasible that larvae were retained at some sites due to small eddies repeatedly circulating passive larvae to particular areas of the lagoon.

Variation in fish distribution between sites was not completely related to the hydrography of the lagoon. Data from sample sites 10, 11 and 12 could be used to show this. These sample sites were between 5.2 and 6.0 km from the lagoon opening

and had similar flow rates. However, site 12 harboured a greater abundance of juveniles which were, on average larger, than those found at sites 10 and 11. There were some factors that differentiated site 12 from the other two. Site 12 had a greater average depth, but this was found to be an insignificant factor in influencing juvenile fish abundances. This site had a lower average root density (13 roots m^{-2}) which was shown to be optimal for juvenile fish at 18 roots m^{-2}, and, the adjacent habitat at site 12 was more complex being composed of seagrass and macroalgae. This contrasted with the almost completely bare sediment adjacent to sites 10 and 11. Thus, it appears that the composition, and abundance of fish at any particular location in the mangrove fringe is also linked to the composition of adjacent habitats.

The influence of site characteristics such as canopy shade, root density (habitat complexity) and the availability of food, in the form of epiphytic prop root algae was explored further by measuring these parameters at each sample site, and correlating fish abundances with these variables. When all species were pooled, juvenile fish showed preferences for increased shade, a moderate habitat complexity and a higher biomass of epiphytic algae. On further analysis of the results, these preferences were found to be species and size class specific, and could account for the variable composition of juveniles at each sample site (Table 5.5). This was an indication that juveniles were selective in their choice of mangrove habitat. However, many areas of suitable mangrove habitat remained under utilised throughout the study period. Adams and Ebersole (2002) noted that the variable distribution and under utilisation of some habitats by juvenile fish in a back lagoon study site in Belize may have been due to insufficient larval supply. It is possible that the apparent under use of much of what appears to be suitable mangrove habitat in Pigeon Creek may be due to poor

larval recruitment. Considering the relative isolation of San Salvador island on a small oceanic platform located away from the Bahama Banks and the cluster of the main island chain in the north east of the Bahamas archipelago, recruitment to nursery habitats from reefs around other islands may be limited. Furthermore, at a large spatial scale, the entrance to the lagoon, which is approximately 150 m across, presents a restricted target for potential new recruits whether their means of transport is passive or active. In contrast to Adams and Ebersole (2002), post settlement influences such as predation, and competition may have been less likely to play a part in juvenile fish distribution given that the protective capacity of much of the mangrove area in the lagoon was presumably much the same.

Some mangrove areas may remain under utilised because larvae are carried in strong tidal currents to the same parts of the lagoon year after year. As the juveniles grow, behavioural responses to vulnerability such as schooling may become an important mechanism for avoiding predation, therefore limiting the desire to spread into other root habitat.

In this study, sites served by relatively strong tidal currents close to the lagoon opening, harboured greater abundances of fish.

7.4 Distribution in mangrove fringe

Fish located along sample transects were often found to utilise a small section of the fringe, and were commonly found in the same vicinity from month to month indicating the possibility of preferences within the mangrove fringe. The reasons for

these variable distributions were investigated using artificial mangrove units. It was found that shade and habitat complexity were both important factors in the decision of juveniles to utilise a particular location. However, experiments showed that once shade and root density reached a particular threshold, further increases in each variable had little affect on fish abundance. Therefore, as long as a site exhibited the minimum level of shade and root density protection, distribution within the mangrove fringe may be determined by another factor, in this case vulnerability. Experiments with the artificial units measured the affects of vulnerability, finding that fewer juveniles utilised units further from the mangrove fringe, and those that did schooled below slightly more shaded and complex units. Distribution within the mangrove fringe may vary with vulnerability with preferred resting locations along the mangrove fringe being areas which permit the easiest escape into the surrounding mangrove fringe.

7.5 Migration to reef habitat

Over the last two decades, researchers have attempted to confirm that mangrove habitat provides a nursery function for juvenile reef fish. Most findings have been inferential because of the difficulties and costs of extensive tracking studies. In the present study, few adults of any reef fish species were found in the lagoon. There was a strong seasonal variation in the mangrove habitat of some size classes of juveniles, in particular the 10 – 15 cm Lutjanids, which would gain less protection from other lagoon habitats. Therefore a number of Lutjanids 10 – 15 cm may migrate seasonally in the winter to the reef. Lutjanids have been shown in different studies to migrate directly from mangrove to adult reef habitat (Thayer *et al.* 1987, Nagelkerken and van

der Velde 2002, Cocheret de la Morinière *et al.* 2002). The reef is the preferred spawning habitat for many species, such as the snappers and the grunts, that are found as juveniles in the lagoon. Therefore it is likely that as they reach maturity, selective preference would be for a reef habitat where they can participate in spawning activities.

Studies looking at different biotopes within shallow water areas have suggested a somewhat systematic migration to adult habitat by some species. This is based on different size classes of juveniles being more common in particular habitats (Cocheret de la Morinière *et al.* 2002), but this hypothesis has some drawbacks, as species may grow at different rates in different habitats, and mortality within different habitats may cause variability in fish populations. However, it is generally understood that habitat utilisation is a trade off between growth rate and predation risk (Dalgren and Eggelston 2000, Nakelkerken and van der Velde 2002, Laegdsgaard and Johnson 2002).

7.6 Selective habitat utilisation

Table 7.1 summarises the factors affecting utilisation of mangrove prop root habitat, and shows that reef fish larvae and juveniles can be selective in their choice of habitat at various spatial scales. Additional evidence showing preference for mangrove prop root habitat was found during this study. Juvenile fish counts were consistently greater in prop root habitat compared to adjacent control sites of mixed seagrass, macroalgae and bare sediment. Artificial mangrove units which had shade canopy without roots or, roots without shade canopy had consistently low numbers of

juveniles below them, indicating that both shade and habitat complexity were important attributes in site selection. Small juveniles showed preference for artificial mangrove units closer to the natural mangrove fringe.

Table 7.1: Summary of factors affecting distribution of juvenile reef fish in *Rhizophora mangle* habitat in Pigeon Creek lagoon.

Factor affecting distribution of juvenile reef fish in *Rhizophora mangle* habitat	Description of findings	
Flow rate	There was a significant relationship between a high tidal flow rate 3 m from the mangrove fringe, and greater abundance of fish. No relationship was found for flow rates 0.5 m from the mangrove fringe.	
Distance from lagoon opening	Increasing distance reduced fish abundances over 2.35km from the lagoon opening. At sites closer to the opening there was no significant affect on the abundance of juvenile fish.	
Depth	Greater depth did not correlate with higher fish abundances when the comparatively much shallower sites (10 and 11) were excluded from the analysis	
Salinity	Salinity correlated with distance from the lagoon opening and had no significant affect on fish abundance and distribution when analysing data from sites 1-8.	
Adjacent habitat composition	Adjacent habitat affected the composition and abundance of juveniles. Where seagrass and algae were abundant, Scarids were more abundant. Where bare sediment habitat was more abundant, Gerreids were more abundant. Fewer fish were found adjacent to large areas of bare sediment.	
	Natural Mangrove	**Artificial Mangrove**
Vulnerability	Not tested	Fewer fish utilised artificial units 3 m from the natural mangrove fringe compared to units 1 m away. Those using the 3 m units occupied units with slightly greater shade and root densities.
Algal Biomass	Abundance of some juveniles was greater at sites with a higher biomass of epiphytic algae.	Not tested
Shade	Abundance of juveniles was greater at sites with higher shade value. This preference was species and size class specific.	Fish preferred shaded units. Above an acceptable shade value further shade had no significant effect.
Root Density	Abundance of juveniles increased with root density and then declined. This preference was species and size class specific.	Fish preferred units which had a certain root density. Further increase in density had no significant effect on fish abundance.

Results from the present study indicate that juvenile fish are selective in their utilisation of *Rhizophora mangle* habitat.

7.7 How selective habitat utilisation may affect mangrove and fisheries management

Some areas were more significant for commercially important fish species, such as snapper and grunts, than others. Therefore, for fisheries management purposes, it may be prudent in mangrove areas to focus resources on the areas which are more likely to contribute most to the adult population. This point of view is supported by Gillanders *et al.* (2003) who suggest that management and habitat conservation could be more judiciously resourced, onto particular sites, rather than focusing on all seagrass, salt marsh or mangrove habitats. Manderson (2003) was concerned that critical nursery habitat is often too broadly defined, leaving conservation efforts open to criticism by commercial and recreational users, politicians and marine scientists. He concluded that an over-simplistic assessment of critical nursery habitats could put marine habitat conservation at risk.

However, fisheries are only one factor in the many functional characteristics of mangrove habitat that need consideration in habitat management. The removal of coastal mangrove for aquaculture and other coastal development increases the vulnerability of coastal areas to erosion, floods and storm damage, and reduces productive coastal areas. These may have limited economic benefits except to the developer. Removal of mangrove habitat causes a decline in fisheries and a reduction of forest products (EJF, 2004). To manage a habitat such as mangrove on the basis

that some areas are more productive than others, and to base development decisions on this criteria would in itself be an over simplification. It is easy to overlook important ecological, and physical roles in coastal protection, supply of organic nutrients to surrounding marine habitats, habitat for non-finfish species and coastal stabilisation (Odum and McIvor 1990).

It is clear that mangrove habitat plays a number of significant roles along the coasts of tropical and sub-tropical landmasses. In fisheries terms, mangrove habitat and other shallow water biotopes have been recognised as 'essential fish habitat', and is the focus of attention for protection, conservation and enhancement under a recent act of Congress in the United States. In global terms mangrove habitat is in decline, with an estimated loss of approximately 50%, but this has varied from country to country with estimated losses of anywhere from 5 – 85 % with particularly extensive loss over the last 50 years (Burke *et al.* 2001). Throughout the world, mangrove forests are considered by many decision makers to be expendable, and are utilised unsustainably in industry and land clearance. Destruction of mangrove habitat for commercial development is common (Nair *et al.* 1979).

Mangrove habitat has been destroyed throughout the Bahamas, most notably in Nassau, (New Providence), Freeport (Grand Bahama), Marsh Harbour (Abaco) and George Town (Great Exuma). These wetlands were cleared for mosquito control and water front access. The Bahamas continues to receive pressure from development, particularly on the less developed outer islands (Buchan 2000).

The effect of mangrove loss on fisheries has been documented (EJF, 2004) although data linking mangrove removal and fisheries decline is limited for the Caribbean region. However, fish community structure and abundances on coral reefs have been shown to be influenced by the presence of mangrove habitat (Nagelkerken *et al.* 2002, Mumby *et al.* 2004, Dorenbosch *et al.* 2004). Given this relationship, and potential future impacts of climate change such as sea level rise and increased tropical storm activity, anthropogenic impacts must be minimised to prevent further catastrophic decline in the Caribbean reef fisheries.

7.8 Future research

The evidence supporting the concept that mangrove habitat is a nursery for juvenile reef fish is still very much inferential. However, extensive tagging or genetic studies could be conclusive in addressing this question. Pigeon Creek, is an excellent location for such a study, as San Salvador island is isolated from the Bahama banks and other islands, which would restrict the export of reef fish from the reefs around the island, once they have migrated from the mangrove habitats of Pigeon Creek. This would increase the chances of recapture for tagging studies or increase the chances of finding genetic matches in DNA analysis. Furthermore, the habitats which have been identified in numerous studies as harbouring reef fish at various life stages occur in a land to sea gradient from the lagoon opening, over a delta onto extensive seagrass beds and then the island's fringing coral reef. This would allow the study of any graduated or variable habitat utilisation during migration from the lagoon.

With a relatively narrow opening, it was originally though that Pigeon Creek would lend itself to studies of fish movement into and out of the lagoon. When developing the present study, trial surveys were done using 300 ft of experimental gill net set across the lagoon opening to determine if this would be a reasonable method of quantifying import and export of fish. Sampling in this manner was hampered by the strong tidal flows which lifted the net clear of the seabed, and pulled the net below the surface. Seaweed and seagrass became tangled in the nets discouraging fish from approaching, and the nets proved to be unwieldy for one person to set and recover. Therefore, if the resources were not available for extensive tag and recapture studies, future studies of fish movement in to and out of the lagoon may be restricted to random sampling by trawl net or visual census.

Studies of larval recruitment and patterns of distribution in the lagoon would be beneficial in confirming some of the findings in this study. A long series of plankton tows for reef fish larvae linked with lunar phase and known spawning times would be beneficial in determining seasonal recruitment, species densities and distribution into each arm of the lagoon. Patterns of distribution in juvenile fish could be investigated further by considering day and night habitat utilisation of mangrove and other lagoon biotopes. Future studies should also be expanded to include other islands in the archipelago to establish any difference between Pigeon Creek and other similar tidal lagoons.

Further studies with artificial mangrove units would be useful at sites with less abundance of snapper and grunts, and would help determine in more detail, how other species interact with shade and root complexity without competing for space. For this

purpose, a change in AMU design would be necessary to reduce canopy fouling. This may be accomplished by testing fouling on differently manufactured shade cloth. It may also be interesting to study the longer term use of AMUs by establishing a series of well anchored artificial mangrove stands of > 30 units and leaving them in place over a time period of years. In this way patterns of recruitment could be correlated with changes in the units as they become more fouled. If the units were found to be robust enough they could potentially be used as interim fish habitat in areas which are undergoing restoration, and being positioned seaward of replanted areas may offer protection to newly established seedlings.

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9. Appendices

Appendix I: Pigeon Creek percentage cover of habitat polygon attributes.

Polynumber	Area m^{-2}	Depth(m)	Seagrass	Macroalgae	Sand/Mud	Rock	Coral	Sponge	Red	Black	Coastal Vegetation
1	11,908	0.0	0	0	0	0	0	0	100	0	0
2	14,567	0.0	0	0	0	0	0	0	100	0	0
3	38,479	1.2	5	5	90	0	0	0	0	0	0
4	2,652	1.2	15	5	80	0	0	0	0	0	0
5	970	0.9	0	40	20	40	0	0	0	0	0
6	13,073	0.9	5	17	78	0	0	0	0	0	0
7	2,264	1.8	60	20	20	0	0	0	0	0	0
8	511	0.0	0	0	0	70	0	0	30	0	0
9	48,528	1.2	2	0	98	0	0	0	0	0	0
10	55,997	1.2	10	0	90	0	0	0	0	0	0
11	111,839	1.2	20	0	80	0	0	0	0	0	0
13	7,249	0.0	0	0	0	65	0	0	30	5	0
14	169,757	1.5	20	0	80	0	0	0	0	0	0
15	40,039	1.5	30	0	70	0	0	0	0	0	0
18	21,133	1.5	20	0	80	0	0	0	0	0	0
19	538	0.9	15	10	75	0	0	0	0	0	0
20	2,952	0.9	5	5	30	59	0	1	0	0	0
21	4,513	0.0	0	0	0	0	0	0	100	0	0
22	2,204	0.0	0	0	0	100	0	0		0	0
23	16,153	1.5	40	20	40	0	0	0	0	0	0
24	17,793	0.9	5	0	95	0	0	0	0	0	0
25	15,451	1.2	30	5	65	0	0	0	0	0	0
26	9,738	1.1	10	5	85	0	0	0	0	0	0
27	3,812	0.3	60	40	0	0	0	0	0	0	0
28	17,400	0.0	0	0	0	0	0	0	100	0	0
29	9,986	0.2	0	0	40	0	0	0	60	0	0
31	2,709	0.6	0	0	85	0	0	0	15	0	0
33	10,962	0.0	0	0	0	75	0	5	20	0	0
34	888	0.0	0	0	60	0	0	0	40	0	0
35	1,761	0.0	0	0	75	0	0	0	25	0	0
36	3,283	0.9	20	5	75	0	0	0	0	0	0
37	1,283	0.8	10	10	80	0	0	0	0	0	0
38	671	0.0	0	0	0	70	0	0	15	5	10
39	2,156	0.3	5	5	90	0	0	0	0	0	0
40	826	0.8	10	10	80	0	0	0	0	0	0
41	6,484	0.6	2	1	96	0	0	1	0	0	0
42	83,216	1.5	20	0	80	0	0	0	0	0	0
45	125,081	1.5	20	0	80	0	0	0	0	0	0
46	12,185	1.5	20	0	80	0	0	0	0	0	0
49	8,698	0.2	0	0	70	0	0	0	15	15	0
50	1,083	0.2	0	0	60	15	0	0	15	10	0
51	19,332	0.2	2	0	98	0	0	0	0	0	0
52	36,481	0.8	10	10	80	0	0	0	0	0	0
55	6,730	0.6	5	5	90	0	0	0	0	0	0
56	12,434	0.6	10	15	75	0	0	0	0	0	0
57	39,220	0.6	15	16	69	0	0	0	0	0	0
58	43,763	1.2	20	0	80	0	0	0	0	0	0
59	16,184	0.2	5	0	95	0	0	0	0	0	0
61	6,574	0.3	20	0	80	0	0	0	0	0	0
62	10,893	0.6	20	0	80	0	0	0	0	0	0
63	305	0.6	25	0	75	0	0	0	0	0	0
64	4,509	0.6	25	0	75	0	0	0	0	0	0
65	7,792	0.6	10	4	86	0	0	0	0	0	0
66	146	0.6	80	5	15	0	0	0	0	0	0
67	3,319	0.0	0	0	45	0	0	0	50	5	0
68	12,252	0.0	0	0	69	0	0	0	30	1	0
70	4,750	0.0	0	0	10	0	0	0	90	0	0
74	6,749	0.0	0	0	0	0	0	0	20	20	60
75	2,462	0.0	0	0	27	26	0	0	40	5	2
76	12,095	0.0	0	0	43	0	0	0	50	5	2
77	3,412	0.0	0	0	20	20	0	0	60	0	0
78	20,382	0.1	0	0	70	0	0	0	25	3	2

79	5,716	0.2	0	0	60	0	0	0	40	0	0
80	1,176	0.0	0	0	20	0	0	0	80	0	0
81	1,590	0.0	0	0	20	0	0	0	80	0	0
82	6,595	0.0	0	0	16	0	0	0	80	2	2
83	7,209	0.2	0	0	40	0	0	0	60	0	0
84	2,505	0.2	0	0	85	0	0	0	15	0	0
85	51,493	0.0	0	0	20	5	0	0	5	60	10
86	8,919	0.1	0	0	76	0	0	0	20	2	2
87	4,800	0.2	5	1	94	0	0	0	0	0	0
88	467	0.3	40	0	60	0	0	0	0	0	0
89	23,715	0.3	2	0	98	0	0	0	0	0	0
90	1,679	0.3	40	0	60	0	0	0	0	0	0
92	2,076	0.1	0	0	50	0	0	0	50	0	0
93	2,548	0.1	0	0	18	0	0	0	80	2	0
94	15,483	0.1	0	0	0	0	0	0	50	50	0
95	1,840	0.2	0	0	45	0	0	0	50	5	0
96	7,688	0.2	0	0	40	0	0	0	60	0	0
97	59,165	0.6	5	2	93	0	0	0	0	0	0
98	1,557	0.0	0	0	0	0	0	0	100	0	0
99	1,851	0.0	0	0	70	0	0	0	30	0	0
100	5,525	0.6	5	15	80	0	0	0	0	0	0
101	2,710	0.1	0	0	70	0	0	0	30	0	0
102	12,901	0.3	15	5	80	0	0	0	0	0	0
103	816	0.0	0	0	38	0	0	0	60	2	0
104	1,893	0.3	15	5	80	0	0	0	0	0	0
105	3,166	0.1	0	0	37	0	0	0	60	3	0
106	10,149	0.3	0	0	70	0	0	0	30	0	0
107	12,042	0.0	0	0	0	0	0	0	0	0	100
109	12,120	0.0	0	0	80	0	0	0	20	0	0
110	1,792	0.3	15	5	80	0	0	0	0	0	0
111	161	0.0	0	0	20	0	0	0	70	10	0
112	2,350	0.0	0	0	80	0	0	0	20	0	0
113	2,640	0.0	0	0	10	0	0	0	20	10	60
114	1,557	0.0	0	0	55	0	0	0	40	5	0
115	1,199	0.3	50	15	35	0	0	0	0	0	0
116	425	0.0	0	0	38	0	0	0	60	1	1
117	5,635	0.3	10	2	88	0	0	0	0	0	0
119	7,150	0.1	0	0	0	0	0	0	100	0	0
120	8,415	0.3	0	0	30	0	0	0	70	0	0
121	13,653	0.3	30	5	50	0	0	0	10	5	0
122	40,544	0.3	10	5	85	0	0	0	0	0	0
124	164,362	0.3	3	3	94	0	0	0	0	0	0
125	734	0.3	10	10	80	0	0	0	0	0	0
126	256	0.3	10	10	80	0	0	0	0	0	0
127	9,379	0.6	10	5	85	0	0	0	0	0	0
128	1,204	0.0	0	0	0	0	0	0	100	0	0
131	27,875	0.9	25	15	60	0	0	0	0	0	0
132	174	0.9	35	15	50	0	0	0	0	0	0
133	49,554	0.3	5	5	90	0	0	0	0	0	0
134	260,440	0.3	3	3	94	0	0	0	0	0	0
135	60,098	0.9	10	5	85	0	0	0	0	0	0
136	8,542	0.0	0	0	0	80	0	0	15	5	0
137	943	0.3	0	0	10	0	0	0	90	0	0
138	7,076	0.0	5	15	80	0	0	0	0	0	0
139	3,602	0.3	0	0	54	20	0	0	25	1	0
140	57,250	0.5	3	3	94	0	0	0	0	0	0
141	17,662	0.9	10	7	83	0	0	0	0	0	0
142	1,149	0.3	0	0	20	0	0	0	80	0	0
143	5,059	0.6	5	5	90	0	0	0	0	0	0
145	26,255	0.9	5	5	90	0	0	0	0	0	0
147	2,425	0.9	0	0	0	0	0	0	100	0	0
149	9,281	0.6	5	5	90	0	0	0	0	0	0
150	7,488	0.9	5	5	90	0	0	0	0	0	0
151	8,622	0.6	5	5	90	0	0	0	0	0	0
152	183,361	1.5	45	15	40	0	0	0	0	0	0
153	2,742	0.9	5	5	90	0	0	0	0	0	0
154	6,248	0.3	5	5	90	0	0	0	0	0	0
156	2,798	0.5	0	0	30	25	0	0	30	14	1
157	12,106	0.0	0	0	0	0	0	0	95	3	2
158	1,843	0.0	0	0	3	42	0	0	50	5	0

160	2,864	0.6	0	0	0	0	0	0	100	0	0
161	520	0.9	90	0	10	0	0	0	0	0	0
162	1,779	0.3	15	5	80	0	0	0	0	0	0
163	2,140	0.3	15	10	75	0	0	0	0	0	0
164	937	0.9	0	0	0	0	0	0	100	0	0
166	17,472	0.9	20	7	73	0	0	0	0	0	0
167	32,468	0.3	15	12	73	0	0	0	0	0	0
170	2,021	0.6	0	0	0	0	0	0	100	0	0
171	1,242	0.1	0	0	0	0	0	0	100	0	0
172	16,961	0.9	20	10	70	0	0	0	0	0	0
173	608	0.0	0	0	0	55	0	0	5	20	20
174	259,409	0.5	5	5	90	0	0	0	0	0	0
176	53,819	0.3	5	5	90	0	0	0	0	0	0
177	33,670	0.6	3	2	95	0	0	0	0	0	0
178	606	0.3	1	0	99	0	0	0	0	0	0
179	648	0.2	0	0	30	0	0	0	70	0	0
180	1,433	0.0	0	0	30	0	0	0	70	0	0
181	931	0.2	5	2	93	0	0	0	0	0	0
182	733	1.2	60	5	35	0	0	0	0	0	0
183	201	0.3	2	2	96	0	0	0	0	0	0
184	535	0.3	2	2	96	0	0	0	0	0	0
185	3,195	0.2	0	0	50	0	0	0	50	0	0
186	6,909	0.3	0	0	70	0	0	0	30	0	0
188	14,920	0.3	0	0	18	0	0	0	80	2	0
189	1,413	0.2	0	0	50	0	0	0	50	0	0
190	4,457	0.3	0	0	70	0	0	0	30	0	0
191	3,472	0.6	0	0	70	0	0	0	30	0	0
194	2,694	0.3	0	0	0	0	0	0	100	0	0
195	27,249	0.9	15	10	75	0	0	0	0	0	0
196	2,814	0.9	0	0	0	0	0	0	98	2	0
199	1,197	0.3	2	2	96	0	0	0	0	0	0
200	310	0.3	0	0	80	0	0	0	20	0	0
201	218	0.3	0	0	80	0	0	0	20	0	0
202	54,492	1.2	10	10	80	0	0	0	0	0	0
203	40,268	0.0	0	0	10	10	0	0	80	0	0
205	11,749	0.9	5	1	94	0	0	0	0	0	0
206	27,577	0.6	2	2	96	0	0	0	0	0	0
207	1,842	0.3	0	0	50	0	0	0	40	10	0
208	4,033	0.3	0	0	79	0	0	0	20	1	0
209	4,347	0.0	0	0	0	0	0	0	20	0	80
210	3,454	0.0	0	0	10	10	0	0	60	20	0
211	9,424	0.6	0	0	0	0	0	0	95	5	0
212	4,683	0.9	30	1	69	0	0	0	0	0	0
213	4,768	0.1	0	0	20	0	0	0	80	0	0
214	9,284	0.6	2	2	96	0	0	0	0	0	0
215	23,761	0.6	40	7	53	0	0	0	0	0	0
216	4,232	0.6	0	0	70	0	0	0	30	0	0
217	3,167	0.3	0	0	40	0	0	0	60	0	0
218	4,424	0.2	0	0	80	0	0	0	20	0	0
219	1,614	0.3	0	0	70	0	0	0	30	0	0
220	8,973	0.3	0	0	70	0	0	0	30	0	0
221	2,546	0.3	0	0	30	0	0	0	70	0	0
225	6,893	0.2	0	0	20	0	0	0	70	5	5
226	5,658	0.3	1	1	90	0	0	0	8	0	0
227	8,039	1.2	10	25	65	0	0	0	0	0	0
228	26,845	0.3	10	10	80	0	0	0	0	0	0
230	3,640	1.2	60	0	40	0	0	0	0	0	0
231	19,808	0.3	0	0	49	0	0	0	50	1	0
233	4,024	0.0	0	0	90	0	0	0	10	0	0
235	36,324	0.0	0	0	5	0	0	0	95	0	0
236	4,779	0.0	0	0	10	0	0	0	90	0	0
239	842	0.2	0	0	0	0	0	0	100	0	0
240	3,159	0.2	0	10	85	0	0	0	5	0	0
241	10,022	0.3	0	0	20	30	0	0	50	0	0
244	15,767	0.2	0	0	0	0	0	0	100	0	0
245	6,672	0.3	0	0	60	0	0	0	40	0	0
246	8,443	0.3	0	0	70	0	0	0	30	0	0
247	13,905	0.3	0	0	70	0	0	0	30	0	0
248	5,817	0.3	0	0	40	0	0	0	60	0	0
249	1,572	0.3	0	0	40	0	0	0	60	0	0

250	23,211	0.3	15	15	70	0	0	0	0	0	0
251	1,258	0.3	0	0	60	0	0	0	40	0	0
252	17,374	0.9	15	15	70	0	0	0	0	0	0
254	96	0.3	0	0	0	0	0	0	100	0	0
255	2,341	0.3	0	0	70	0	0	0	30	0	0
256	4,749	0.3	0	0	30	0	0	0	70	0	0
259	721	0.3	0	0	80	0	0	0	20	0	0
260	2,513	0.3	0	0	80	0	0	0	20	0	0
261	1,795	0.3	0	0	70	0	0	0	30	0	0
262	754	0.3	0	0	60	0	0	0	40	0	0
263	313	0.3	0	0	60	0	0	0	40	0	0
264	295	0.3	70	10	20	0	0	0	0	0	0
265	8,404	1.2	40	6	54	0	0	0	0	0	0
266	127	0.3	50	12	38	0	0	0	0	0	0
267	11,640	0.3	0	0	20	0	0	0	80	0	0
269	6,451	0.3	0	0	40	0	0	0	60	0	0
270	9,297	0.3	0	0	70	0	0	0	30	0	0
271	906	0.3	0	0	80	0	0	0	20	0	0
273	28,867	0.2	25	5	70	0	0	0	0	0	0
275	2,240	0.3	0	0	80	0	0	0	20	0	0
276	4,976	0.2	0	0	15	15	0	0	60	5	5
277	2,971	0.2	0	0	70	0	0	0	30	0	0
278	1,578	0.2	0	0	70	0	0	0	30	0	0
279	9,835	0.2	0	0	70	0	0	0	30	0	0
282	9,297	0.3	15	5	80	0	0	0	0	0	0
283	1,112	0.6	60	10	30	0	0	0	0	0	0
284	3,142	0.6	0	0	0	0	0	0	100	0	0
285	1,707	0.3	95	5	0	0	0	0	0	0	0
286	2,197	0.3	0	0	70	0	0	0	30	0	0
287	22,250	0.3	0	0	80	0	0	0	20	0	0
288	10,279	0.3	0	0	70	0	0	0	30	0	0
289	2,439	0.3	0	0	30	0	0	0	70	0	0
290	1,394	0.3	0	0	40	0	0	0	60	0	0
291	4,137	0.3	0	0	70	0	0	0	30	0	0
292	23,831	0.2	0	0	10	10	0	0	70	5	5
293	3,640	0.3	0	0	70	0	0	0	30	0	0
295	9,137	0.3	0	0	70	0	0	0	30	0	0
296	1,019	0.3	0	0	40	0	0	0	60	0	0
297	5,828	0.6	40	10	50	0	0	0	0	0	0
298	7,773	1.5	50	10	40	0	0	0	0	0	0
299	10,440	0.0	10	5	85	0	0	0	0	0	0
300	6,968	0.0	0	0	30	0	0	0	70	0	0
301	13,393	0.0	0	0	15	0	0	0	70	15	0
303	3,013	0.2	0	10	90	0	0	0	0	0	0
304	49,720	0.0	0	0	10	0	0	0	90	0	0
306	16,092	0.0	0	0	10	0	0	0	90	0	0
307	14,144	0.3	0	10	70	0	0	0	20	0	0
308	19,287	0.0	0	0	10	5	0	0	80	5	0
309	15,577	0.2	0	0	0	0	0	0	95	5	0
310	13,276	0.2	0	0	40	25	0	0	30	5	0
311	397	1.2	0	0	0	0	0	0	100	0	0
312	2,712	0.3	0	0	70	0	0	0	30	0	0
313	3,849	0.5	25	5	70	0	0	0	0	0	0
314	3,554	0.3	0	0	40	0	0	0	60	0	0
315	15,722	0.3	0	0	70	0	0	0	30	0	0
316	1,589	0.3	0	0	40	0	0	0	60	0	0
317	7,996	0.2	0	0	70	0	0	0	30	0	0
318	8,114	0.3	0	0	70	0	0	0	30	0	0
319	2,017	0.3	0	0	40	0	0	0	60	0	0
320	4,637	0.3	0	0	70	0	0	0	30	0	0
322	16,296	0.5	25	5	70	0	0	0	0	0	0
323	1,716	0.2	0	0	80	0	0	0	20	0	0
324	11,356	0.2	25	5	70	0	0	0	0	0	0
325	5,545	0.0	0	0	5	5	0	0	90	0	0
326	4,182	0.0	0	0	20	0	0	0	80	0	0
327	1,625	0.0	0	0	40	0	0	0	60	0	0
328	7,374	0.3	1	0	99	0	0	0	0	0	0
329	9,282	0.3	0	0	100	0	0	0	0	0	0
330	512	0.0	0	0	0	0	0	0	100	0	0
332	11,672	0.9	40	10	50	0	0	0	0	0	0

334	1,112	0.3	0	0	70	0	0	0	30	0	0
335	667	0.3	0	0	70	0	0	0	30	0	0
336	4,976	0.3	0	0	80	0	0	0	20	0	0
337	1,658	0.3	0	0	70	0	0	0	30	0	0
338	1,954	0.3	0	0	40	0	0	0	60	0	0
339	5,380	0.3	0	0	70	0	0	0	30	0	0
340	8,602	0.3	0	0	20	0	0	0	80	0	0
342	7,296	0.3	0	0	70	0	0	0	30	0	0
343	11,090	0.3	0	0	10	0	0	0	90	0	0
345	6,090	0.3	0	0	70	0	0	0	30	0	0
347	3,147	0.3	0	0	70	0	0	0	30	0	0
348	2,095	0.3	0	0	10	0	0	0	90	0	0
350	1,121	0.2	10	0	60	0	0	0	30	0	0
351	1,793	0.3	0	0	70	0	0	0	30	0	0
352	1,741	0.3	0	0	80	0	0	0	20	0	0
353	3,486	0.2	0	0	60	0	0	0	40	0	0
354	1,225	0.3	0	0	70	0	0	0	30	0	0
356	2,204	0.3	0	0	80	0	0	0	20	0	0
358	3,018	0.3	0	0	80	0	0	0	20	0	0
359	3,421	0.3	0	0	75	0	0	0	25	0	0
360	3,311	0.3	0	0	75	0	0	0	25	0	0
362	2,778	0.3	0	0	80	0	0	0	20	0	0
363	2,377	0.3	0	0	80	0	0	0	20	0	0
364	18,003	0.3	0	0	5	0	0	0	95	0	0
365	9,094	1.8	95	0	5	0	0	0	0	0	0
366	4,346	1.8	95	0	5	0	0	0	0	0	0
367	18,893	2.1	5	0	95	0	0	0	0	0	0
368	5,925	1.5	2	0	98	0	0	0	0	0	0
369	2,347	0.0	0	0	30	0	0	0	70	0	0
370	1,685	0.0	0	0	15	0	0	0	85	0	0
371	3,877	0.0	0	0	70	0	0	0	30	0	0
372	3,197	0.0	50	0	50	0	0	0	0	0	0
374	14,170	0.3	0	0	0	0	0	0	90	5	5
376	452	0.3	10	0	90	0	0	0	0	0	0
378	4,813	0.6	0	30	70	0	0	0	0	0	0
379	2,538	0.9	50	0	50	0	0	0	0	0	0
380	2,997	0.2	5	2	93	0	0	0	0	0	0
381	4,070	0.0	10	0	90	0	0	0	0	0	0
382	4,658	0.6	90	5	5	0	0	0	0	0	0
384	3,737	0.0	80	0	20	0	0	0	0	0	0
385	4,322	0.0	0	0	100	0	0	0	0	0	0
388	1,848	0.3	0	0	80	0	0	0	20	0	0
389	568	1.8	100	0	0	0	0	0	0	0	0
390	11,395	2.4	1	1	98	0	0	0	0	0	0
391	2,250	0.6	70	0	30	0	0	0	0	0	0
392	954	1.2	70	0	30	0	0	0	0	0	0
393	10,755	0.3	50	20	30	0	0	0	0	0	0
394	62,218	1.5	50	25	25	0	0	0	0	0	0
395	6,802	0.3	50	20	30	0	0	0	0	0	0
396	1,963	0.3	5	5	90	0	0	0	0	0	0
397	6,816	0.2	0	0	40	8	0	0	50	2	0
398	20,947	0.2	0	0	5	0	0	0	85	5	5
399	24,686	0.0	0	0	10	0	0	0	90	0	0
400	2,203	0.8	0	0	0	0	0	0	100	0	0
401	8,764	0.1	10	25	60	0	0	0	5	0	0
402	194	0.2	0	5	75	0	0	0	20	0	0
403	597	0.2	0	0	10	10	0	0	80	0	0
406	9,121	0.2	15	5	40	0	0	0	40	0	0
407	39,597	0.2	20	5	75	0	0	0	0	0	0
408	449	0.2	0	0	5	0	0	0	95	0	0
409	4,887	0.3	15	5	80	0	0	0	0	0	0
411	21,507	0.6	60	25	15	0	0	0	0	0	0
412	11,937	0.3	30	15	55	0	0	0	0	0	0
413	567	0.9	10	0	90	0	0	0	0	0	0
414	12,091	0.9	0	0	0	0	0	0	100	0	0
415	20,990	0.6	20	20	60	0	0	0	0	0	0
416	4,252	3.0	70	10	20	0	0	0	0	0	0
417	22,380	0.9	0	0	0	0	0	0	100	0	0
418	11,832	0.9	20	32	48	0	0	0	0	0	0
419	7,694	0.9	30	15	55	0	0	0	0	0	0

420	223	1.2	40	20	40	0	0	0	0	0	0
421	72,632	1.5	30	30	40	0	0	0	0	0	0
423	32,213	0.9	30	40	30	0	0	0	0	0	0
425	59,944	0.6	30	25	45	0	0	0	0	0	0
426	39,709	0.6	15	5	80	0	0	0	0	0	0
427	925	0.8	0	0	0	0	0	0	100	0	0
428	644	0.9	1	0	99	0	0	0	0	0	0
429	7,724	1.5	30	30	40	0	0	0	0	0	0
430	7,714	0.6	60	20	20	0	0	0	0	0	0
432	86,009	1.2	50	20	30	0	0	0	0	0	0
433	3,403	0.9	0	0	0	0	0	0	100	0	0
434	8,858	0.9	0	0	0	0	0	0	100	0	0
435	6,773	0.9	15	10	75	0	0	0	0	0	0
436	13,539	0.6	30	5	65	0	0	0	0	0	0
437	17,479	0.9	30	22	48	0	0	0	0	0	0
438	4,988	0.3	5	5	75	0	0	0	15	0	0
439	623	0.3	10	10	60	0	0	0	20	0	0
440	7,157	0.3	0	0	0	0	0	0	100	0	0
441	902	0.3	10	10	70	0	0	0	10	0	0
442	2,262	0.3	5	0	35	0	0	0	60	0	0
444	7,435	0.3	10	5	65	0	0	0	20	0	0
445	3,513	0.6	2	0	38	20	0	0	40	0	0
446	4,247	0.3	0	0	20	0	0	0	80	0	0
448	29,063	0.6	60	10	30	0	0	0	0	0	0
449	1,597	0.3	0	0	40	0	0	0	60	0	0
450	4,899	0.3	0	0	10	0	0	0	90	0	0
451	90,776	0.5	10	10	80	0	0	0	0	0	0
453	23,839	0.6	15	5	80	0	0	0	0	0	0
454	67,677	0.5	3	1	96	0	0	0	0	0	0
455	4,881	0.2	0	0	50	0	0	0	50	0	0
456	1,989	0.3	5	5	60	0	0	0	30	0	0
457	835	0.3	5	5	20	0	0	0	70	0	0
458	11,216	0.3	10	10	79	0	0	0	1	0	0
459	4,722	0.3	0	0	80	10	0	0	10	0	0
460	6,363	0.3	0	25	15	0	0	0	60	0	0
461	5,528	0.3	0	5	75	0	0	0	20	0	0
462	13,457	0.3	0	20	30	0	0	0	50	0	0
463	160,760	0.3	0	0	10	0	0	0	90	0	0
466	11,193	0.5	3	1	96	0	0	0	0	0	0
468	22,239	0.3	0	1	99	0	0	0	0	0	0
469	7,839	0.3	0	0	30	0	0	0	70	0	0
470	901	0.3	0	0	80	0	0	0	20	0	0
471	7,914	0.2	0	0	30	0	0	0	70	0	0
473	33,341	0.0	0	0	0	0	0	0	95	5	0
476	9,732	0.6	40	50	10	0	0	0	0	0	0
477	5,199	0.6	0	0	40	0	0	0	60	0	0
478	2,500	0.3	0	0	0	5	0	0	90	5	0
479	6,799	1.2	30	25	45	0	0	0	0	0	0
481	2,519	1.2	10	60	30	0	0	0	0	0	0
482	100,839	1.2	10	60	30	0	0	0	0	0	0
483	56,067	0.6	0	0	20	0	0	0	80	0	0
485	21,069	0.6	10	5	85	0	0	0	0	0	0
491	58,798	0.9	70	25	5	0	0	0	0	0	0
492	17,387	0.6	0	0	0	0	0	0	95	5	0
493	30,084	0.6	0	0	0	0	0	0	95	5	0
497	29,768	0.3	0	0	5	15	0	0	70	5	5
499	19,179	0.6	0	0	0	0	0	0	100	0	0
1001	7,346	0.0	0	0	55	10	0	0	35	0	0
1002	913	0.2	0	0	53	0	0	0	45	2	0
1003	58	0.3	0	0	0	0	0	0	100	0	0
1004	159	0.2	0	0	0	0	0	0	100	0	0
1005	15,564	1.5	20	0	80	0	0	0	0	0	0
1006	1,500	0.9	20	10	70	0	0	0	0	0	0
1007	15,015	0.6	40	30	30	0	0	0	0	0	0
1008	1,745	0.2	70	30	0	0	0	0	0	0	0
1009	6,175	0.2	0	0	80	0	0	0	20	0	0
1010	307	0.0	0	0	5	80	0	0	15	0	0
1011	508	0.6	10	10	80	0	0	0	0	0	0
1012	1,112	0.5	10	10	80	0	0	0	0	0	0
1013	902	0.0	0	0	85	0	0	0	15	0	0

1014	4,315	0.5	0	0	0	0	0	0	100	0	0
1015	165	0.6	10	15	75	0	0	0	0	0	0
1016	226	0.6	0	0	0	0	0	0	100	0	0
1017	1,381	0.6	5	15	80	0	0	0	0	0	0
1018	119	0.0	0	0	40	0	0	0	60	0	0
1019	109	0.0	0	0	60	0	0	0	40	0	0
1020	13,723	0.0	0	0	95	0	0	0	5	0	0
1021	36,119	0.3	3	1	96	0	0	0	0	0	0
1022	4,024	0.2	0	0	70	0	0	0	30	0	0
1023	333	0.0	0	0	10	0	0	0	90	0	0
1024	4,811	0.0	0	0	0	0	0	0	100	0	0
1025	5,584	0.0	0	0	70	0	0	0	30	0	0
1026	8,771	0.0	0	0	50	0	0	0	50	0	0
1027	3,788	0.0	0	0	40	0	0	0	60	0	0
1028	2,137	0.0	0	0	95	0	0	0	5	0	0
1029	885	0.2	10	0	80	0	0	0	10	0	0
1030	3,852	0.2	0	0	70	0	0	0	30	0	0
1031	3,662	0.3	30	5	65	0	0	0	0	0	0
1032	1,105	0.2	0	0	90	0	0	0	10	0	0
1033	408	0.3	0	0	0	0	0	0	100	0	0
1034	1,078	0.3	0	0	0	0	0	0	100	0	0
1035	157	0.3	0	0	0	0	0	0	100	0	0
1036	677	0.0	0	0	5	0	0	0	95	0	0
1037	286	0.0	0	0	5	0	0	0	95	0	0
1038	889	0.2	0	0	15	15	0	0	70	0	0
1039	329	0.6	15	10	75	0	0	0	0	0	0
1040	68	0.3	0	0	0	0	0	0	100	0	0
1041	740	0.0	0	0	20	10	0	0	70	0	0
1042	7,335	0.0	0	0	10	0	0	0	90	0	0
1043	98	0.2	0	0	0	0	0	0	100	0	0
1044	14,577	0.0	0	0	95	0	0	0	5	0	0
1045	72	0.2	0	0	0	0	0	0	100	0	0
1046	51	0.2	0	0	0	0	0	0	100	0	0
1047	2,544	0.2	0	0	90	0	0	0	10	0	0
1048	2,311	0.2	0	0	60	0	0	0	40	0	0
1049	1,269	0.2	0	0	60	0	0	0	40	0	0
1050	625	0.2	0	0	40	0	0	0	60	0	0
1051	1,139	0.2	0	0	40	0	0	0	60	0	0
1052	643	0.2	0	0	50	0	0	0	50	0	0
1053	3,856	0.2	0	0	40	0	0	0	60	0	0
1054	694	0.0	0	0	50	0	0	0	50	0	0
1055	857	0.6	0	0	0	0	0	0	100	0	0
1056	2,918	0.2	5	0	95	0	0	0	0	0	0
1057	24	0.2	0	0	0	0	0	0	100	0	0
1058	493	0.2	0	0	85	0	0	0	15	0	0
1059	3,084	0.0	0	0	50	10	0	0	40	0	0
1060	578	0.2	0	0	70	0	0	0	30	0	0
1061	190	0.2	0	0	70	0	0	0	30	0	0
1062	175	0.2	0	0	70	0	0	0	30	0	0
1063	4,852	0.3	0	0	0	0	0	0	100	0	0
1064	207	0.2	0	0	70	0	0	0	30	0	0
1065	6,865	0.2	0	0	45	0	0	0	55	0	0
1066	5,279	0.6	0	0	10	0	0	0	90	0	0
1067	9,134	0.3	0	0	40	0	0	0	60	0	0
1068	653	0.0	0	0	40	0	0	0	60	0	0
1070	3,237	0.0	0	0	20	0	0	0	80	0	0
1071	19,880	0.2	0	0	5	0	0	0	95	0	0
1072	667	0.3	95	0	5	0	0	0	0	0	0
1073	2,715	0.6	40	0	60	0	0	0	0	0	0
1074	4,314	0.0	0	0	50	35	0	0	15	0	0
1075	2,129	0.2	0	0	40	0	0	0	60	0	0
1076	1,682	0.6	3	0	97	0	0	0	0	0	0
1078	499	1.2	70	10	20	0	0	0	0	0	0
1079	1,066	1.2	90	10	0	0	0	0	0	0	0
1080	2,229	1.2	70	10	20	0	0	0	0	0	0
1081	3,798	0.2	40	10	50	0	0	0	0	0	0
1082	1,376	0.2	20	2	78	0	0	0	0	0	0
1083	1,726	0.2	1	0	99	0	0	0	0	0	0
1084	3,908	1.2	85	5	10	0	0	0	0	0	0
1085	3,473	0.0	0	0	40	40	0	0	20	0	0

1086	8,104	0.0	0	0	40	0	0	0	60	0	0
1087	1,863	0.0	0	0	40	0	0	0	60	0	0
1088	4,401	0.9	70	10	20	0	0	0	0	0	0
1089	3,069	0.0	0	0	100	0	0	0	0	0	0
1090	5,854	0.9	20	5	75	0	0	0	0	0	0
1091	733	0.6	70	10	20	0	0	0	0	0	0
1092	871	0.2	0	0	100	0	0	0	0	0	0
1093	1,947	0.0	0	0	20	10	0	0	70	0	0
1094	958	0.2	80	5	15	0	0	0	0	0	0
1095	40	0.9	80	5	15	0	0	0	0	0	0
1096	1,271	1.2	0	0	100	0	0	0	0	0	0
1097	74	0.6	90	5	5	0	0	0	0	0	0
1098	29	0.6	90	5	5	0	0	0	0	0	0
1099	1,394	0.9	0	0	100	0	0	0	0	0	0
1360	11,497	0.6	10	5	85	0	0	0	0	0	0
1521	1,580	0.8	0	0	0	5	0	0	95	0	0
2000	4,076	2.4	5	2	90	2	1	0	0	0	0
2001	2,993	1.8	2	1	97	0	0	0	0	0	0
2002	142	1.5	80	0	20	0	0	0	0	0	0
2003	1,437	1.8	0	0	100	0	0	0	0	0	0
2004	413	0.3	2	0	98	0	0	0	0	0	0
2005	2,829	0.0	0	0	0	0	0	0	100	0	0
2006	67	0.9	95	0	5	0	0	0	0	0	0
2007	289	1.2	80	0	20	0	0	0	0	0	0
2008	726	0.6	70	10	20	0	0	0	0	0	0
2009	2,863	0.3	0	0	2	13	0	0	85	0	0
2010	513	0.3	0	0	5	25	0	0	70	0	0
2011	4,868	0.0	0	0	0	0	0	0	98	2	0
2012	196	0.5	2	0	98	0	0	0	0	0	0
2013	46	0.0	0	0	0	0	0	0	100	0	0
2014	49	0.0	0	0	0	0	0	0	100	0	0
2015	507	0.0	0	0	40	0	0	0	60	0	0
2016	1,007	0.0	0	0	90	0	0	0	10	0	0
2017	3,376	0.9	0	0	0	0	0	0	100	0	0
2018	221	0.9	2	0	98	0	0	0	0	0	0
2019	469	0.9	60	25	15	0	0	0	0	0	0
2020	2,139	0.9	0	0	5	5	0	0	90	0	0
2021	522	0.8	0	0	5	0	0	0	95	0	0
2022	923	0.0	0	0	40	20	0	0	40	0	0
2023	4,699	0.3	0	0	0	20	0	0	80	0	0
2024	1,068	0.6	20	0	20	0	0	0	60	0	0
2025	618	0.6	10	0	40	0	0	0	50	0	0
2026	239	0.6	0	0	40	0	0	0	60	0	0
2027	30,285	0.0	0	0	4	1	0	0	95	0	0
2028	1,185	0.6	0	0	0	0	0	0	100	0	0
2029	2,013	0.6	0	0	5	0	0	0	95	0	0
2030	2,157	0.6	0	0	0	0	0	0	100	0	0
2031	1,380	0.2	0	0	0	0	0	0	100	0	0
2032	962	0.2	0	0	10	0	0	0	90	0	0
2033	8,736	0.0	0	0	40	0	0	0	60	0	0
2034	2,231	0.0	0	0	60	0	0	0	40	0	0
2035	10,352	0.6	0	0	0	0	0	0	100	0	0
2036	1,650	0.2	0	0	80	0	0	0	20	0	0
2037	5,425	3.6	10	5	0	85	0	0	0	0	0
2038	7,409	0.6	10	2	88	0	0	0	0	0	0
2039	7,517	0.9	0	0	0	0	0	0	100	0	0
2040	18,260	0.9	0	0	0	0	0	0	100	0	0
2041	2,997	0.6	0	0	0	0	0	0	100	0	0
2042	1,164	0.6	0	0	0	0	0	0	100	0	0
2043	836	0.6	0	0	0	0	0	0	100	0	0
2044	467	0.9	0	0	40	30	0	0	30	0	0
2045	904	0.9	20	5	75	0	0	0	0	0	0
2046	242	1.2	0	0	0	0	0	0	100	0	0
2047	659	0.6	0	0	0	0	0	0	100	0	0
2048	258	0.6	0	0	0	0	0	0	100	0	0
2049	2,754	0.6	20	5	75	0	0	0	0	0	0
2050	1,488	0.6	20	5	75	0	0	0	0	0	0
2051	15,821	2.1	5	0	95	0	0	0	0	0	0
2052	13,927	0.6	0	0	0	0	0	0	100	0	0
2053	7,672	1.2	80	20	0	0	0	0	0	0	0

2054	29,682	0.9	60	20	20	0	0	0	0	0	0
2055	9,199	0.0	0	0	30	50	0	0	20	0	0
2056	13,241	0.9	30	5	65	0	0	0	0	0	0
2057	6,963	0.6	25	5	70	0	0	0	0	0	0
2058	882	0.6	80	20	0	0	0	0	0	0	0
2131	228	1.5	60	0	40	0	0	0	0	0	0
2132	1,077	1.5	100	0	0	0	0	0	0	0	0
2133	1,034	1.5	60	0	40	0	0	0	0	0	0
2134	598	1.5	80	0	20	0	0	0	0	0	0
2135	1,267	1.5	80	0	20	0	0	0	0	0	0
2291	178	1.5	60	0	40	0	0	0	0	0	0
2292	491	1.2	60	0	40	0	0	0	0	0	0
2293	516	1.2	60	0	40	0	0	0	0	0	0
2294	477	1.2	90	0	10	0	0	0	0	0	0
2295	202	0.5	20	0	80	0	0	0	0	0	0
2296	660	0.5	60	0	40	0	0	0	0	0	0
2297	59	0.3	100	0	0	0	0	0	0	0	0
2610	163	0.2	0	0	0	0	0	0	100	0	0
3201	1,830	0.2	0	0	45	0	0	0	55	0	0
3281	906	0.2	0	0	20	0	0	0	80	0	0
3341	715	0.3	0	0	45	0	0	0	55	0	0
3351	694	0.3	0	0	30	0	0	0	70	0	0
3831	79	1.2	100	0	0	0	0	0	0	0	0
3832	118	1.2	100	0	0	0	0	0	0	0	0
3833	419	1.2	100	0	0	0	0	0	0	0	0
10771	144	1.5	60	0	40	0	0	0	0	0	0
10772	219	1.5	60	0	40	0	0	0	0	0	0
10773	160	1.5	60	0	40	0	0	0	0	0	0
TOTAL	6,260,676	0.0									

APPENDIX II: Physical data recorded monthly at each sample site. Salinity, dissolved oxygen, pH, and average depth (see chapter 3 for sampling methods), nd = no data.

Site	Sample Number	Salinity	DO	PH	Average Depth (cm)
1	1	37.0	3.6	8.2	nd
1	2	34.0	nd	8.4	nd
1	3	34.0	4.6	8.3	55.5
1	4	34.0	2.6	8.1	nd
1	5	35.0	6.5	8.3	34.8
1	6	40.0	4.0	8.3	72.2
1	7	34.0	6.4	8.4	50.0
1	8	38.0	4.5	8.3	37.3
1	9	42.0	6.4	8.4	26.8
1	10	37.0	nd	8.3	37.5
1	11	39.0	6.2	8.5	40.6
1	12	41.0	5.6	8.4	36.6
1	13	38.0	4.4	8.2	43.1
1	14	37.0	3.4	8.1	38.0
1	15	33.0	4.6	7.8	51.3
1	16	40.0	4.6	8.0	38.5
1	17	36.0	5.2	8.1	50.0
1	18	40.0	5.4	8.3	54.0
1	19	39.0	5.0	8.3	39.0
1	20	39.0	5.6	8.4	37.1
2	1	38.0	2.6	8.2	nd
2	2	34.0	5.4	8.5	nd
2	3	31.0	5.4	8.3	90.0
2	4	33.0	3.2	8.1	78.5
2	5	35.0	6.0	8.3	63.3
2	6	38.0	4.0	8.3	106.0
2	7	35.0	7.0	8.4	84.8
2	8	37.0	3.8	8.3	58.6
2	9	40.0	5.6	8.3	59.5
2	10	37.0	nd	8.4	68.5
2	11	40.0	4.6	8.5	68.8
2	12	40.0	5.0	8.4	68.8
2	13	38.0	4.6	8.1	69.1
2	14	38.0	4.2	8.2	62.6
2	15	35.0	5.0	8.0	79.0
2	16	40.0	5.8	8.0	70.3
2	17	35.0	6.0	8.1	81.0
2	18	39	5.8	8.2	80.6
2	19	39.0	7.4	8.3	72.3
2	20	38.0	5.6	8.4	81.8
3	1	37.0	2.2	8.3	nd
3	2	35.0	6.2	8.4	nd
3	3	30.0	5.6	8.4	77.2
3	4	34.0	5.0	8.1	67.3
3	5	35.0	4.8	8.3	45.5
3	6	38.0	4.0	8.3	90.3
3	7	37.0	6.0	8.4	75.0
3	8	37.0	4.6	8.3	48.6
3	9	39.0	6.4	8.4	50.0
3	10	35.0	nd	8.4	57.6
3	11	37.0	4.6	8.4	53.1
3	12	37.0	4.6	8.5	55.3
3	13	35.0	3.2	8.0	55.0
3	14	34.0	3.5	8.2	55.0

3	15	33.0	5.0	8.0	63.5
3	16	37.0	6.6	8.0	50.5
3	17	39.0	5.0	8.1	66.6
3	18	39.0	5.4	8.2	66.3
3	19	37.0	5.2	8.2	60.3
3	20	36.0	5.4	8.3	71.6
4	1	35.0	5.0	8.3	nd
4	2	34.0	5.4	8.4	nd
4	3	37.0	5.0	8.4	75.0
4	4	35.0	5.0	8.1	43.0
4	5	34.0	5.1	8.4	33.0
4	6	37.0	4.2	8.2	79.0
4	7	39.0	5.6	8.4	83.0
4	8	34.0	5.5	8.2	42.3
4	9	37.0	5.8	8.5	53.6
4	10	36.0	nd	8.5	62.1
4	11	36.0	5.0	8.2	68.3
4	12	37.0	5.2	8.5	55.1
4	13	36.0	4.0	8.2	65.8
4	14	34.0	5.0	8.3	81.6
4	15	35.0	5.0	8.0	74.0
4	16	40.0	5.8	8.0	63.5
4	17	37.0	6.0	8.2	80.0
4	18	37.0	7.2	8.2	75.0
4	19	37.0	5.6	8.3	63.8
4	20	37.0	5.0	8.4	75.3
5	1	35.0	3.6	8.0	nd
5	2	33.0	4.7	8.3	nd
5	3	35.0	4.8	8.4	68.0
5	4	35.0	2.6	8.0	15.0
5	5	36.0	4.4	8.4	32.5
5	6	37.0	4.2	8.3	46.0
5	7	38.0	5.6	8.4	65.0
5	8	37.0	5.2	8.5	51.5
5	9	37.0	5.3	8.3	38.1
5	10	36.0	nd	8.4	28.5
5	11	36.0	5.0	8.3	49.1
5	12	36.0	5.2	8.3	38.8
5	13	35.0	4.2	8.1	48.8
5	14	37.0	5.0	8.2	71.6
5	15	35.0	5.2	8.0	54.5
5	16	40.0	5.0	8.1	33.8
5	17	37.0	4.6	8.2	56.8
5	18	37.0	4.6	8.2	58.6
5	19	37.0	5.0	8.3	46.3
5	20	36.0	5.4	8.2	57.0
6	1	36.0	5.0	8.1	nd
6	2	35.0	6.2	8.4	nd
6	3	33.0	5.6	8.4	81.6
6	4	35.0	5.2	8.2	42.5
6	5	36.0	5.6	8.3	29.5
6	6	36.0	4.6	8.1	56.5
6	7	38.0	5.6	8.4	76.1
6	8	37.0	6.0	8.4	65.6
6	9	37.0	6.6	8.4	50.6
6	10	36.0	nd	8.3	58.2
6	11	34.0	5.2	8.3	58.0
6	12	38.0	4.0	8.4	51.0
6	13	35.0	4.0	8.0	61.6
6	14	34.0	4.6	8.3	85.8
6	15	35.0	4.5	7.9	73.8
6	16	40.0	5.0	7.9	54.0

6	17	35.0	5.6	8.0	74.1
6	18	39.0	4.8	8.3	72.0
6	19	37.0	5.0	8.4	68.1
6	20	37.0	5.4	8.3	74.8
7	1	38.0	3.4	8.2	nd
7	2	30.0	5.6	8.2	nd
7	3	34.0	5.0	8.4	73.1
7	4	35.0	4.2	8.1	49.3
7	5	36.0	4.0	8.3	56.0
7	6	34.0	4.4	8.1	59.0
7	7	38.0	6.5	8.4	67.8
7	8	37.0	5.6	8.3	61.0
7	9	40.0	4.4	8.4	43.3
7	10	38.0	nd	8.4	47.0
7	11	35.0	5.0	8.3	47.6
7	12	37.0	4.8	8.4	47.5
7	13	36.0	5.0	8.3	64.0
7	14	34.0	4.8	8.2	81.8
7	15	34.0	5.0	8.0	83.6
7	16	41.0	5.0	8.0	60.8
7	17	35.0	5.6	8.1	68.5
7	18	40.0	4.8	8.3	71.1
7	19	37.0	6.0	8.4	71.5
7	20	35.0	5.6	8.3	72.5
8	1	37.0	3.8	8.2	nd
8	2	30.0	5.6	8.2	nd
8	3	35.0	4.6	8.3	71.8
8	4	35.0	4.0	8.2	45.6
8	5	37.0	4.6	8.2	62.0
8	6	34.0	5.0	8.2	58.0
8	7	37.0	6.5	8.4	55.0
8	8	35.0	5.4	8.3	51.6
8	9	40.0	6.6	8.4	41.3
8	10	37.0	nd	8.4	46.0
8	11	37.0	5.2	8.3	45.0
8	12	38.0	4.4	8.4	45.1
8	13	38.0	4.5	8.0	57.0
8	14	35.0	4.6	8.2	69.0
8	15	37.0	4.0	8.2	71.8
8	16	38.0	5.0	8.0	63.3
8	17	35.0	4.8	8.2	59.8
8	18	38.0	4.8	8.1	57.5
8	19	37.0	4.6	8.3	64.6
8	20	37.0	5.0	8.2	66.6
9	1	36.0	4.4	8.1	nd
9	2	31.0	6.4	8.2	nd
9	3	35.0	5.4	8.3	80.1
9	4	36.0	3.8	8.1	81.8
9	5	36.0	4.0	8.2	66.0
9	6	35.0	5.0	8.1	65.1
9	7	38.0	5.4	8.3	68.1
9	8	36.0	4.5	8.2	55.1
9	9	41.0	4.8	8.2	47.0
9	10	40.0	nd	8.3	48.3
9	11	41.0	6.0	8.4	50.5
9	12	39.0	5.2	8.4	52.6
9	13	36.0	4.2	8.0	59.5
9	14	43.0	3.0	8.2	51.3
9	15	36.0	3.8	7.9	80.6
9	16	42.0	5.2	8.0	70.8
9	17	33.0	5.2	8.0	58.6
9	18	40.0	4.6	8.0	60.8

9	19	40.0	4.6	8.4	67.1
9	20	37.0	6.2	8.4	69.6
10	1	34.0	5.0	8.1	nd
10	2	36.0	3.7	8.2	nd
10	3	39.0	4.2	8.3	41.8
10	4	37.0	3.6	8.2	44.5
10	5	34.0	4.8	8.2	21.6
10	6	36.0	5.4	8.2	23.3
10	7	33.0	5.4	8.1	18.8
10	8	35.0	4.6	8.2	21.8
10	9	43.0	4.0	8.2	18.6
10	10	40.0	nd	8.3	19.3
10	11	44.0	5.0	8.4	13.3
10	12	44.0	4.8	nd	13.3
10	13	42.0	4.8	8.0	20.6
10	14	45.0	3.0	8.1	17.0
10	15	40.0	5.0	8.1	27.1
10	16	43.0	5.6	8.1	7.3
10	17	33.0	5.6	8.1	6.3
10	18	36.0	6.2	8.1	21.5
10	19	41.0	5.0	8.2	20.0
10	20	40.0	5.0	8.2	26.6
11	1	36.0	3.8	8.0	nd
11	2	34.0	3.7	8.2	nd
11	3	38.0	4.4	8.3	47.1
11	4	37.0	3.6	8.2	50.0
11	5	34.0	4.0	8.2	29.5
11	6	37.0	6.4	8.1	32.0
11	7	36.0	4.4	8.2	23.5
11	8	37.0	4.4	8.2	28.3
11	9	44.0	4.2	8.1	25.6
11	10	39.0	nd	8.1	25.1
11	11	44.0	5.4	8.3	18.1
11	12	44.0	4.2	8.2	19.6
11	13	43.0	3.8	8.1	27.5
11	14	45.0	3.0	8.0	23.5
11	15	40.0	4.6	8.0	30.8
11	16	43.0	4.6	8.0	11.6
11	17	35.0	5.0	8.1	11.8
11	18	37.0	5.6	8.2	28.5
11	19	41.0	5.6	8.2	26.0
11	20	41.0	4.2	8.1	31.8
12	1	35.0	4.4	8.2	nd
12	2	33.0	3.8	8.2	nd
12	3	36.0	5.0	8.4	87.5
12	4	36.0	3.8	8.0	93.5
12	5	35.0	4.2	8.2	64.6
12	6	35.0	5.6	8.2	67.1
12	7	36.0	5.6	8.3	nd
12	8	35.0	4.5	8.2	73.6
12	9	43.0	3.6	8.2	70.6
12	10	41.0	nd	8.2	70.1
12	11	42.0	5.6	8.3	62.6
12	12	42.0	4.2	8.4	63.6
12	13	42.0	4.8	8.1	72.1
12	14	47.0	3.0	8.0	69.0
12	15	40.0	5.0	8.0	77.6
12	16	44.0	4.8	8.3	56.5
12	17	36.0	4.6	8.1	56.1
12	18	38.0	6.6	8.1	72.5
12	19	40.0	5.6	8.2	72.5
12	20	40.0	4.2	8.0	88.3

APPENDIX III - Fish family abundance and size class data for juvenile fish at twelve sample sites in Pigeon Creek lagoon.

Site	Date	*Family*	<5cm	5-10cm	10-15cm	15-20cm	20-30cm	30-40cm	>40cm	Abundance
1	Jun-99	*Chaetodontidae*	2	0	0	0	0	0	0	2
1	Jun-99	*Gerreidae*	16	15	2	0	0	0	0	33
1	Jun-99	*Haemulidae*	0	1	0	0	0	0	0	1
1	Jun-99	*Lutjanidae*	9	10	8	1	0	0	0	28
1	Jun-99	*Pomacentridae*	0	3	1	0	0	0	0	4
1	Jun-99	*Scaridae*	0	14	1	0	0	0	0	15
1	Jun-99	*Sphyraenidae*	0	1	0	0	2	0	0	3
1	Jul-99	*Gerreidae*	17	4	5	0	0	0	0	26
1	Jul-99	*Haemulidae*	0	3	0	2	0	0	0	5
1	Jul-99	*Lutjanidae*	2	4	8	1	0	0	0	15
1	Jul-99	*Pomacentridae*	4	0	0	0	0	0	0	4
1	Jul-99	*Scaridae*	0	26	0	0	0	0	0	26
1	Jul-99	*Sphyraenidae*	0	0	1	0	1	2	0	4
1	Aug-99	*Gerreidae*	14	12	1	0	0	0	0	27
1	Aug-99	*Haemulidae*	0	1	1	0	0	0	0	2
1	Aug-99	*Lutjanidae*	5	6	0	3	0	0	0	14
1	Aug-99	*Pomacentridae*	7	1	0	0	0	0	0	8
1	Aug-99	*Scaridae*	55	5	0	0	0	0	0	60
1	Oct-99	*Chaetodontidae*	7	0	0	0	0	0	0	7
1	Oct-99	*Gerreidae*	0	3	1	0	0	0	0	4
1	Oct-99	*Haemulidae*	0	1	0	0	0	0	0	1
1	Oct-99	*Lutjanidae*	15	11	3	1	0	0	0	30
1	Oct-99	*Mullidae*	0	1	0	0	0	0	0	1
1	Oct-99	*Pomacentridae*	6	1	0	0	0	0	0	7
1	Oct-99	*Scaridae*	163	37	1	0	0	0	0	201
1	Oct-99	*Sphyraenidae*	0	0	0	0	1	1	0	2
1	Nov-99	*Chaetodontidae*	3	0	0	0	0	0	0	3
1	Nov-99	*Gerreidae*	2	3	1	0	0	0	0	6
1	Nov-99	*Lutjanidae*	2	18	2	0	0	0	0	22
1	Nov-99	*Pomacentridae*	1	0	0	0	0	0	0	1
1	Nov-99	*Scaridae*	127	64	0	0	0	0	0	191
1	Nov-99	*Sphyraenidae*	0	2	0	0	1	0	0	3
1	Nov-99	*Tetraodontidae*	0	0	0	1	0	0	0	1
1	Dec-99	*Chaetodontidae*	4	0	0	0	0	0	0	4
1	Dec-99	*Gerreidae*	0	4	1	1	0	0	0	6
1	Dec-99	*Haemulidae*	0	0	2	1	0	0	0	3
1	Dec-99	*Labridae*	0	3	0	0	0	0	0	3
1	Dec-99	*Lutjanidae*	2	1	2	0	0	0	0	5
1	Dec-99	*Pomacentridae*	0	6	0	0	0	0	0	6
1	Dec-99	*Scaridae*	52	115	4	0	0	0	0	171
1	Dec-99	*Sphyraenidae*	0	0	1	0	1	0	0	2
1	Jan-00	*Gerreidae*	1	2	4	1	0	2	0	10
1	Jan-00	*Lutjanidae*	1	0	1	0	0	0	0	2
1	Jan-00	*Scaridae*	0	35	0	0	0	0	0	35
1	Jan-00	*Sphyraenidae*	0	0	1	0	0	0	0	1
1	Feb-00	*Chaetodontidae*	1	0	0	0	0	0	0	1
1	Feb-00	*Gerreidae*	0	0	2	1	0	0	0	3
1	Feb-00	*Labridae*	0	0	2	0	0	0	0	2
1	Feb-00	*Lutjanidae*	2	4	1	0	0	0	0	7
1	Feb-00	*Pomacentridae*	1	1	0	0	0	0	0	2
1	Feb-00	*Scaridae*	12	75	1	0	0	0	0	88
1	Feb-00	*Sphyraenidae*	0	0	0	0	0	1	0	1
1	Feb-00	*Tetraodontidae*	0	0	0	1	0	0	0	1
1	Mar-00	*Gerreidae*	6	0	2	0	0	0	0	8
1	Mar-00	*Labridae*	0	1	0	0	0	0	0	1
1	Mar-00	*Lutjanidae*	1	1	0	0	0	0	0	2
1	Mar-00	*Scaridae*	0	33	1	0	0	0	0	34
1	Mar-00	*Sphyraenidae*	0	0	0	1	0	0	0	1
1	Apr-00	*Chaetodontidae*	1	0	0	0	0	0	0	1
1	Apr-00	*Gerreidae*	3	2	0	0	0	0	0	5
1	Apr-00	*Labridae*	0	0	1	0	0	0	0	1
1	Apr-00	*Lutjanidae*	2	3	0	0	0	0	0	5
1	Apr-00	*Pomacentridae*	2	0	0	0	0	0	0	2
1	Apr-00	*Scaridae*	142	17	0	0	0	0	0	159
1	Apr-00	*Sphyraenidae*	0	0	1	0	0	1	0	2
1	Apr-00	*Tetraodontidae*	0	0	0	2	0	0	0	2
1	May-00	*Gerreidae*	5	2	2	0	0	0	0	9
1	May-00	*Lutjanidae*	2	0	0	0	0	0	0	2

1	May-00	*Pomacentridae*	2	0	0	0	0	0	0	**2**
1	May-00	*Scaridae*	21	117	0	0	0	0	0	**138**
1	May-00	*Sphyraenidae*	0	0	0	1	0	1	0	**2**
1	Jun-00	*Gerreidae*	12	16	0	0	0	0	0	**28**
1	Jun-00	*Haemulidae*	2	0	0	0	0	0	0	**2**
1	Jun-00	*Lutjanidae*	2	12	3	0	0	0	0	**17**
1	Jun-00	*Pomacentridae*	2	0	0	0	0	0	0	**2**
1	Jun-00	*Scaridae*	25	107	0	0	0	0	0	**132**
1	Jun-00	*Sphyraenidae*	0	0	0	0	1	0	0	**1**
1	Jul-00	*Gerreidae*	0	16	3	0	0	0	0	**19**
1	Jul-00	*Haemulidae*	2	5	2	0	0	0	0	**9**
1	Jul-00	*Lutjanidae*	1	2	8	0	0	0	0	**11**
1	Jul-00	*Pomacentridae*	1	1	0	0	0	0	0	**2**
1	Jul-00	*Scaridae*	52	57	13	0	0	0	0	**122**
1	Aug-00	*Chaetodontidae*	4	1	0	0	0	0	0	**5**
1	Aug-00	*Gerreidae*	0	8	0	0	0	0	0	**8**
1	Aug-00	*Haemulidae*	0	0	2	0	0	0	0	**2**
1	Aug-00	*Labridae*	0	1	0	0	0	0	0	**1**
1	Aug-00	*Lutjanidae*	5	2	20	2	0	0	0	**29**
1	Aug-00	*Pomacentridae*	1	2	0	0	0	0	0	**3**
1	Aug-00	*Scaridae*	36	58	0	0	0	0	0	**94**
1	Aug-00	*Sphyraenidae*	0	0	0	1	0	0	0	**1**
1	Oct-00	*Gerreidae*	0	4	5	0	0	0	0	**9**
1	Oct-00	*Haemulidae*	0	0	4	0	0	0	0	**4**
1	Oct-00	*Labridae*	0	0	1	0	0	0	0	**1**
1	Oct-00	*Lutjanidae*	2	2	8	0	0	0	0	**12**
1	Oct-00	*Mullidae*	0	0	3	0	0	0	0	**3**
1	Oct-00	*Pomacentridae*	4	5	0	0	0	0	0	**9**
1	Oct-00	*Scaridae*	59	50	3	0	0	0	0	**112**
1	Oct-00	*Sphyraenidae*	0	0	0	1	0	1	0	**2**
1	Oct-00	*Tetraodontidae*	0	0	0	1	0	0	0	**1**
1	Nov-00	*Gerreidae*	3	7	0	0	0	0	0	**10**
1	Nov-00	*Lutjanidae*	2	3	0	0	0	0	0	**5**
1	Nov-00	*Pomacentridae*	1	0	0	0	0	0	0	**1**
1	Nov-00	*Scaridae*	6	1	1	0	0	0	0	**8**
1	Dec-00	*Chaetodontidae*	3	1	0	0	0	0	0	**4**
1	Dec-00	*Gerreidae*	0	0	6	0	0	0	0	**6**
1	Dec-00	*Haemulidae*	0	0	3	0	0	0	0	**3**
1	Dec-00	*Lutjanidae*	1	4	7	7	1	0	0	**20**
1	Dec-00	*Pomacentridae*	2	2	0	0	0	0	0	**4**
1	Dec-00	*Scaridae*	67	37	1	0	0	1	0	**106**
1	Jan-01	*Chaetodontidae*	2	0	0	0	0	0	0	**2**
1	Jan-01	*Gerreidae*	0	0	9	0	0	0	0	**9**
1	Jan-01	*Lutjanidae*	1	1	1	0	0	0	0	**3**
1	Jan-01	*Pomacentridae*	2	0	0	0	0	0	0	**2**
1	Jan-01	*Scaridae*	16	0	0	0	0	0	0	**16**
1	Jan-01	*Sphyraenidae*	0	0	0	0	1	0	0	**1**
1	Feb-01	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
1	Feb-01	*Gerreidae*	0	2	0	0	0	0	0	**2**
1	Feb-01	*Labridae*	0	1	0	0	0	0	0	**1**
1	Feb-01	*Lutjanidae*	0	1	1	0	0	0	0	**2**
1	Feb-01	*Pomacentridae*	1	2	0	0	0	0	0	**3**
1	Feb-01	*Scaridae*	76	9	0	0	0	0	0	**85**
1	Mar-01	*Chaetodontidae*	3	0	0	0	0	0	0	**3**
1	Mar-01	*Gerreidae*	0	2	1	0	0	0	0	**3**
1	Mar-01	*Haemulidae*	0	0	1	0	0	0	0	**1**
1	Mar-01	*Labridae*	0	3	0	1	0	0	0	**4**
1	Mar-01	*Lutjanidae*	0	3	5	3	0	0	0	**11**
1	Mar-01	*Mullidae*	0	0	1	0	0	0	0	**1**
1	Mar-01	*Pomacentridae*	6	1	0	0	0	0	0	**7**
1	Mar-01	*Scaridae*	77	47	0	0	0	0	0	**124**
1	Mar-01	*Tetraodontidae*	0	0	0	0	1	0	0	**1**
2	Jun-99	*Belonidae*	0	0	4	0	0	0	0	**4**
2	Jun-99	*Chaetodontidae*	0	3	0	0	0	0	0	**3**
2	Jun-99	*Haemulidae*	0	0	14	5	0	0	0	**19**
2	Jun-99	*Lutjanidae*	0	2	25	7	1	0	0	**35**
2	Jun-99	*Mullidae*	0	0	1	0	0	0	0	**1**
2	Jun-99	*Pomacentridae*	0	1	0	0	0	0	0	**1**
2	Jun-99	*Scaridae*	0	46	9	2	0	0	0	**57**
2	Jun-99	*Sphyraenidae*	0	2	0	3	1	0	0	**6**
2	Jul-99	*Chaetodontidae*	5	0	0	0	0	0	0	**5**
2	Jul-99	*Gerreidae*	0	4	2	0	0	0	0	**6**
2	Jul-99	*Haemulidae*	0	14	1	1	0	0	0	**16**
2	Jul-99	*Lutjanidae*	0	2	9	3	1	0	0	**15**

2	Jul-99	*Scaridae*	23	3	4	3	0	0	0	**33**
2	Jul-99	*Sphyraenidae*	0	0	0	3	1	0	0	**4**
2	Aug-99	*Chaetodontidae*	0	2	0	0	0	0	0	**2**
2	Aug-99	*Gerreidae*	1	3	1	0	0	0	0	**5**
2	Aug-99	*Haemulidae*	0	8	0	2	1	0	0	**11**
2	Aug-99	*Lutjanidae*	4	2	3	3	1	0	0	**13**
2	Aug-99	*Ostraciidae*	0	0	0	0	1	0	0	**1**
2	Aug-99	*Pomacentridae*	0	1	0	0	0	0	0	**1**
2	Aug-99	*Scaridae*	135	25	1	1	0	0	0	**162**
2	Aug-99	*Sphyraenidae*	0	0	0	0	0	0	2	**2**
2	Oct-99	*Chaetodontidae*	0	1	0	0	0	0	0	**1**
2	Oct-99	*Gerreidae*	0	4	3	0	0	0	0	**7**
2	Oct-99	*Haemulidae*	0	0	15	0	0	0	0	**15**
2	Oct-99	*Lutjanidae*	4	7	5	0	0	0	0	**16**
2	Oct-99	*Pomacentridae*	1	0	0	0	0	0	0	**1**
2	Oct-99	*Scaridae*	1	1	1	2	0	0	0	**5**
2	Oct-99	*Sphyraenidae*	0	0	0	0	2	0	0	**2**
2	Nov-99	*Gerreidae*	0	2	3	0	0	0	0	**5**
2	Nov-99	*Haemulidae*	0	0	1	0	0	0	0	**1**
2	Nov-99	*Lutjanidae*	0	3	2	1	0	0	0	**6**
2	Nov-99	*Scaridae*	0	1	1	1	0	0	0	**3**
2	Nov-99	*Sphyraenidae*	0	0	0	0	0	1	1	**2**
2	Dec-99	*Gerreidae*	0	1	5	0	0	0	0	**6**
2	Dec-99	*Haemulidae*	0	1	8	0	0	0	0	**9**
2	Dec-99	*Lutjanidae*	0	0	7	0	0	0	0	**7**
2	Dec-99	*Scaridae*	0	0	6	5	0	0	0	**11**
2	Dec-99	*Sphyraenidae*	0	0	0	0	1	1	0	**2**
2	Jan-00	*Gerreidae*	0	0	0	1	0	0	0	**1**
2	Jan-00	*Haemulidae*	0	0	2	0	0	0	0	**2**
2	Jan-00	*Scaridae*	0	0	0	1	0	0	0	**1**
2	Jan-00	*Sphyraenidae*	0	0	0	0	0	1	0	**1**
2	Feb-00	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
2	Feb-00	*Gerreidae*	0	0	0	1	0	0	0	**1**
2	Feb-00	*Lutjanidae*	0	1	0	0	0	0	0	**1**
2	Feb-00	*Pomacentridae*	1	0	0	0	0	0	0	**1**
2	Feb-00	*Scaridae*	0	0	2	1	0	0	0	**3**
2	Feb-00	*Sphyraenidae*	0	0	0	1	0	1	0	**2**
2	Feb-00	*Tetraodontidae*	0	0	0	1	0	0	0	**1**
2	Mar-00	*Chaetodontidae*	4	0	0	0	0	0	0	**4**
2	Mar-00	*Gerreidae*	0	0	0	2	0	0	0	**2**
2	Mar-00	*Haemulidae*	1	2	2	0	0	0	0	**5**
2	Mar-00	*Lutjanidae*	0	0	0	1	0	0	0	**1**
2	Mar-00	*Pomacentridae*	0	1	0	0	0	0	0	**1**
2	Mar-00	*Scaridae*	0	1	1	1	0	0	0	**3**
2	Apr-00	*Gerreidae*	0	1	0	0	0	0	0	**1**
2	Apr-00	*Haemulidae*	2	0	2	0	0	0	0	**4**
2	Apr-00	*Lutjanidae*	1	0	0	0	0	0	0	**1**
2	Apr-00	*Pomacentridae*	1	0	0	0	0	0	0	**1**
2	Apr-00	*Scaridae*	14	0	1	5	0	0	0	**20**
2	Apr-00	*Sphyraenidae*	0	0	0	1	0	1	0	**2**
2	Apr-00	*Tetraodontidae*	2	0	0	0	0	0	0	**2**
2	May-00	*Haemulidae*	0	0	0	1	0	0	0	**1**
2	May-00	*Scaridae*	10	17	1	1	0	0	0	**29**
2	May-00	*Sphyraenidae*	0	0	0	0	0	1	0	**1**
2	Jun-00	*Gerreidae*	0	0	2	0	0	0	0	**2**
2	Jun-00	*Haemulidae*	2	0	0	1	0	0	0	**3**
2	Jun-00	*Lutjanidae*	1	0	0	0	0	0	0	**1**
2	Jun-00	*Pomacentridae*	1	0	0	0	0	0	0	**1**
2	Jun-00	*Scaridae*	28	2	1	0	0	0	0	**31**
2	Jul-00	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
2	Jul-00	*Gerreidae*	0	0	8	0	0	0	0	**8**
2	Jul-00	*Haemulidae*	0	8	6	1	0	0	0	**15**
2	Jul-00	*Lutjanidae*	0	4	4	3	0	0	0	**11**
2	Jul-00	*Pomacentridae*	0	1	0	0	0	0	0	**1**
2	Jul-00	*Scaridae*	46	1	1	0	0	0	0	**48**
2	Jul-00	*Sphyraenidae*	0	0	0	0	0	0	1	**1**
2	Aug-00	*Gerreidae*	0	1	3	0	0	0	0	**4**
2	Aug-00	*Haemulidae*	0	0	3	0	0	0	0	**3**
2	Aug-00	*Lutjanidae*	0	0	7	4	0	0	0	**11**
2	Aug-00	*Scaridae*	30	0	0	0	0	0	0	**30**
2	Aug-00	*Sphyraenidae*	0	0	2	2	3	1	1	**9**
2	Aug-00	*Tetraodontidae*	0	0	0	0	1	0	0	**1**
2	Oct-00	*Gerreidae*	0	0	2	0	0	0	0	**2**
2	Oct-00	*Haemulidae*	1	0	1	5	0	0	0	**7**

2	Oct-00	*Lutjanidae*	0	0	2	3	0	0	0	5
2	Oct-00	*Mullidae*	0	0	1	0	0	0	0	1
2	Oct-00	*Pomacentridae*	1	0	0	0	0	0	0	1
2	Oct-00	*Scaridae*	9	0	0	0	0	0	0	9
2	Oct-00	*Sphyraenidae*	0	0	0	0	0	1	0	1
2	Nov-00	*Lutjanidae*	0	1	0	0	0	0	0	1
2	Dec-00	*Gerreidae*	0	0	1	0	0	0	0	1
2	Dec-00	*Haemulidae*	0	0	0	1	1	0	0	2
2	Dec-00	*Lutjanidae*	0	4	9	2	0	0	0	15
2	Dec-00	*Scaridae*	3	3	0	0	0	0	0	6
2	Dec-00	*Sphyraenidae*	0	0	0	0	1	1	0	2
2	Dec-00	*Tetraodontidae*	0	0	0	0	1	0	0	1
2	Jan-01	*Gobiidae*	3	0	0	0	0	0	0	3
2	Jan-01	*Lutjanidae*	1	0	1	0	0	0	0	2
2	Jan-01	*Sphyraenidae*	0	0	0	1	0	0	0	1
2	Feb-01	*Gerreidae*	0	0	0	1	0	0	0	1
2	Feb-01	*Lutjanidae*	0	0	2	2	0	0	0	4
2	Feb-01	*Mullidae*	0	0	1	0	0	0	0	1
2	Feb-01	*Scaridae*	18	0	0	0	0	0	0	18
2	Feb-01	*Tetraodontidae*	0	0	0	0	1	0	0	1
2	Mar-01	*Chaetodontidae*	1	0	0	0	0	0	0	1
2	Mar-01	*Haemulidae*	0	0	0	2	0	0	0	2
2	Mar-01	*Lutjanidae*	0	0	1	3	0	0	0	4
2	Mar-01	*Scaridae*	16	2	0	0	0	0	0	18
3	Jun-99	*Chaetodontidae*	4	1	0	0	0	0	0	5
3	Jun-99	*Gerreidae*	0	1	2	0	0	0	0	3
3	Jun-99	*Haemulidae*	0	1	1	0	0	0	0	2
3	Jun-99	*Labridae*	1	0	0	0	0	0	0	1
3	Jun-99	*Lutjanidae*	1	5	6	30	3	0	0	45
3	Jun-99	*Mullidae*	0	1	0	0	0	0	0	1
3	Jun-99	*Pomacentridae*	5	0	0	0	0	0	0	5
3	Jun-99	*Scaridae*	107	105	3	0	0	0	0	215
3	Jun-99	*Sphyraenidae*	1	1	8	1	0	0	0	11
3	Jul-99	*Belonidae*	0	0	0	10	0	0	0	10
3	Jul-99	*Chaetodontidae*	0	6	0	0	0	0	0	6
3	Jul-99	*Gerreidae*	0	0	5	0	0	0	0	5
3	Jul-99	*Haemulidae*	0	4	5	1	1	0	0	11
3	Jul-99	*Lutjanidae*	0	3	23	7	4	0	0	37
3	Jul-99	*Pomacentridae*	1	0	0	0	0	0	0	1
3	Jul-99	*Scaridae*	23	21	4	0	0	0	0	48
3	Jul-99	*Serranidae*	0	0	0	1	0	0	0	1
3	Jul-99	*Sphyraenidae*	0	0	0	2	1	0	0	3
3	Jul-99	*Tetraodontidae*	0	0	0	3	0	0	0	3
3	Aug-99	*Gerreidae*	0	5	2	1	0	0	0	8
3	Aug-99	*Gobiidae*	1	0	0	0	0	0	0	1
3	Aug-99	*Haemulidae*	0	0	5	2	0	0	0	7
3	Aug-99	*Lutjanidae*	1	7	3	7	0	0	0	18
3	Aug-99	*Pomacentridae*	1	1	0	0	0	0	0	2
3	Aug-99	*Scaridae*	67	19	1	0	0	0	0	87
3	Aug-99	*Serranidae*	0	0	0	1	0	0	0	1
3	Aug-99	*Sphyraenidae*	0	0	0	1	0	0	0	1
3	Aug-99	*Tetraodontidae*	0	0	0	0	17	2	0	19
3	Oct-99	*Gerreidae*	0	1	0	0	0	0	0	1
3	Oct-99	*Haemulidae*	0	0	10	2	0	0	0	12
3	Oct-99	*Lutjanidae*	4	4	11	0	0	0	0	19
3	Oct-99	*Pomacentridae*	0	1	0	0	0	0	0	1
3	Oct-99	*Scaridae*	15	7	0	0	0	0	0	22
3	Oct-99	*Sphyraenidae*	0	0	0	1	0	0	0	1
3	Nov-99	*Gerreidae*	1	3	0	0	0	0	0	4
3	Nov-99	*Haemulidae*	0	0	1	0	0	0	0	1
3	Nov-99	*Lutjanidae*	3	6	7	0	0	0	0	16
3	Nov-99	*Mullidae*	0	0	1	0	0	0	0	1
3	Nov-99	*Ostraciidae*	0	0	0	0	1	0	0	1
3	Nov-99	*Pomacentridae*	2	2	0	0	0	0	0	4
3	Nov-99	*Scaridae*	5	10	0	1	0	0	0	16
3	Nov-99	*Sphyraenidae*	0	0	1	0	0	2	1	4
3	Dec-99	*Carangidae*	0	0	0	1	0	0	0	1
3	Dec-99	*Gerreidae*	0	0	1	6	0	0	0	7
3	Dec-99	*Haemulidae*	0	3	3	0	0	0	0	6
3	Dec-99	*Lutjanidae*	0	1	2	1	0	0	0	4
3	Dec-99	*Mullidae*	0	0	5	0	0	0	0	5
3	Dec-99	*Pomacentridae*	1	1	0	0	0	0	0	2
3	Dec-99	*Scaridae*	0	0	2	2	0	0	0	4
3	Dec-99	*Sphyraenidae*	0	0	1	0	0	1	0	2

3	Dec-99	*Tetraodontidae*	0	0	0	1	0	0	0	1
3	Jan-00	*Gerreidae*	0	0	1	0	0	0	0	1
3	Jan-00	*Gobiidae*	3	0	0	0	0	0	0	3
3	Jan-00	*Lutjanidae*	0	0	3	0	0	0	0	3
3	Jan-00	*Pomacentridae*	1	0	0	0	0	0	0	1
3	Jan-00	*Scaridae*	10	0	1	0	0	0	0	11
3	Jan-00	*Sphyraenidae*	0	0	0	0	0	1	1	2
3	Jan-00	*Tetraodontidae*	0	0	0	2	0	0	0	2
3	Feb-00	*Chaetodontidae*	0	1	0	0	0	0	0	1
3	Feb-00	*Gobiidae*	1	0	0	0	0	0	0	1
3	Feb-00	*Lutjanidae*	0	1	1	0	0	0	0	2
3	Feb-00	*Mullidae*	0	0	1	0	0	0	0	1
3	Feb-00	*Scaridae*	2	14	4	0	0	0	0	20
3	Feb-00	*Sphyraenidae*	0	0	0	2	1	1	0	4
3	Mar-00	*Gerreidae*	0	0	3	1	0	0	0	4
3	Mar-00	*Gobiidae*	4	0	0	0	0	0	0	4
3	Mar-00	*Haemulidae*	2	0	2	1	0	0	0	5
3	Mar-00	*Lutjanidae*	0	0	4	0	0	0	0	4
3	Mar-00	*Lutjanidae*	0	2	0	0	0	0	0	2
3	Mar-00	*Mullidae*	0	0	1	0	0	0	0	1
3	Mar-00	*Ostraciidae*	0	0	0	0	1	0	0	1
3	Mar-00	*Pomacentridae*	1	0	0	0	0	0	0	1
3	Mar-00	*Scaridae*	17	15	3	0	0	0	0	35
3	Mar-00	*Sphyraenidae*	0	0	1	0	0	0	1	2
3	Mar-00	*Tetraodontidae*	0	0	4	0	0	0	0	4
3	Apr-00	*Gerreidae*	1	0	2	0	0	0	0	3
3	Apr-00	*Gobiidae*	1	0	0	0	0	0	0	1
3	Apr-00	*Haemulidae*	6	1	1	0	0	0	0	8
3	Apr-00	*Lutjanidae*	1	2	2	0	0	0	0	5
3	Apr-00	*Pomacentridae*	2	1	0	0	0	0	0	3
3	Apr-00	*Scaridae*	103	3	2	0	0	0	0	108
3	Apr-00	*Sphyraenidae*	0	0	0	0	1	0	0	1
3	May-00	*Gerreidae*	0	0	2	2	0	0	0	4
3	May-00	*Gobiidae*	1	0	0	0	0	0	0	1
3	May-00	*Haemulidae*	1	0	0	1	0	0	0	2
3	May-00	*Scaridae*	9	10	1	0	0	0	0	20
3	May-00	*Serranidae*	0	0	1	0	0	0	0	1
3	May-00	*Sphyraenidae*	0	0	0	0	0	1	1	2
3	Jun-00	*Chaetodontidae*	1	0	0	0	0	0	0	1
3	Jun-00	*Gerreidae*	0	1	6	1	0	0	0	8
3	Jun-00	*Gobiidae*	1	0	0	0	0	0	0	1
3	Jun-00	*Haemulidae*	6	8	0	0	0	0	0	14
3	Jun-00	*Labridae*	0	6	0	0	0	0	0	6
3	Jun-00	*Lutjanidae*	1	4	4	2	0	0	0	11
3	Jun-00	*Pomacentridae*	1	0	0	0	0	0	0	1
3	Jun-00	*Scaridae*	22	17	5	0	0	0	0	44
3	Jun-00	*Sphyraenidae*	0	1	5	1	0	0	2	9
3	Jun-00	*Tetraodontidae*	0	0	0	1	0	0	0	1
3	Jul-00	*Chaetodontidae*	3	0	0	0	0	0	0	3
3	Jul-00	*Gerreidae*	1	2	4	1	0	0	0	8
3	Jul-00	*Haemulidae*	0	0	0	1	0	0	0	1
3	Jul-00	*Lutjanidae*	0	2	0	2	0	0	0	4
3	Jul-00	*Pomacentridae*	1	0	0	0	0	0	0	1
3	Jul-00	*Scaridae*	21	7	0	0	0	0	0	28
3	Jul-00	*Sphyraenidae*	0	0	0	2	1	0	0	3
3	Aug-00	*Gerreidae*	0	8	1	0	0	0	0	9
3	Aug-00	*Haemulidae*	1	0	1	0	0	0	0	2
3	Aug-00	*Lutjanidae*	3	14	14	1	0	0	0	32
3	Aug-00	*Pomacentridae*	3	0	0	0	0	0	0	3
3	Aug-00	*Scaridae*	40	1	0	0	0	0	0	41
3	Aug-00	*Sphyraenidae*	0	0	2	1	1	0	0	4
3	Aug-00	*Tetraodontidae*	0	0	0	4	0	0	0	4
3	Oct-00	*Chaetodontidae*	1	0	0	0	0	0	0	1
3	Oct-00	*Gerreidae*	0	1	2	1	0	0	0	4
3	Oct-00	*Haemulidae*	0	0	1	0	0	0	0	1
3	Oct-00	*Labridae*	4	0	0	0	0	0	0	4
3	Oct-00	*Lutjanidae*	1	5	18	3	0	0	0	27
3	Oct-00	*Pomacentridae*	1	0	0	0	0	0	0	1
3	Oct-00	*Scaridae*	75	0	0	0	1	0	0	76
3	Oct-00	*Sphyraenidae*	0	0	1	1	1	0	0	3
3	Oct-00	*Tetraodontidae*	0	0	0	2	0	0	0	2
3	Nov-00	*Chaetodontidae*	1	1	0	0	0	0	0	2
3	Nov-00	*Gerreidae*	0	3	0	5	0	0	0	8
3	Nov-00	*Haemulidae*	10	0	0	0	0	0	0	10

3	Nov-00	*Labridae*	2	0	0	0	0	0	0	**2**
3	Nov-00	*Lutjanidae*	0	1	0	0	0	0	0	**1**
3	Nov-00	*Pomacentridae*	2	1	0	0	0	0	0	**3**
3	Nov-00	*Scaridae*	20	0	1	0	0	0	0	**21**
3	Nov-00	*Sphyraenidae*	0	1	0	3	2	0	1	**7**
3	Dec-00	*Chaetodontidae*	2	0	0	0	0	0	0	**2**
3	Dec-00	*Gerreidae*	0	0	2	4	1	0	0	**7**
3	Dec-00	*Haemulidae*	0	0	0	2	0	0	0	**2**
3	Dec-00	*Labridae*	4	0	1	0	0	0	0	**5**
3	Dec-00	*Lutjanidae*	0	4	4	2	0	0	0	**10**
3	Dec-00	*Mullidae*	0	1	0	0	0	0	0	**1**
3	Dec-00	*Pomacentridae*	1	1	0	0	0	0	0	**2**
3	Dec-00	*Scaridae*	134	29	1	0	0	0	0	**164**
3	Dec-00	*Sphyraenidae*	0	0	0	0	2	0	2	**4**
3	Dec-00	*Tetraodontidae*	0	0	0	0	2	0	0	**2**
3	Jan-01	*Gerreidae*	0	0	8	3	1	0	0	**12**
3	Jan-01	*Gobiidae*	5	0	0	0	0	0	0	**5**
3	Jan-01	*Labridae*	0	3	0	0	0	0	0	**3**
3	Jan-01	*Lutjanidae*	0	0	1	0	0	0	0	**1**
3	Jan-01	*Pomacentridae*	1	0	0	0	0	0	0	**1**
3	Jan-01	*Scaridae*	46	0	0	0	0	0	0	**46**
3	Jan-01	*Sphyraenidae*	0	0	1	0	0	0	0	**1**
3	Jan-01	*Tetraodontidae*	0	0	1	0	1	0	0	**2**
3	Feb-01	*Gerreidae*	0	0	4	0	0	0	0	**4**
3	Feb-01	*Gobiidae*	22	0	0	0	0	0	0	**22**
3	Feb-01	*Haemulidae*	3	0	0	0	0	0	0	**3**
3	Feb-01	*Lutjanidae*	0	0	0	2	0	0	0	**2**
3	Feb-01	*Pomacentridae*	1	1	0	0	0	0	0	**2**
3	Feb-01	*Scaridae*	65	1	0	0	0	0	0	**66**
3	Feb-01	*Sphyraenidae*	0	0	0	0	2	1	0	**3**
3	Mar-01	*Gerreidae*	0	0	2	0	0	0	0	**2**
3	Mar-01	*Haemulidae*	5	0	0	0	0	0	0	**5**
3	Mar-01	*Labridae*	0	5	0	0	0	0	0	**5**
3	Mar-01	*Lutjanidae*	0	1	2	4	0	0	0	**7**
3	Mar-01	*Pomacentridae*	1	1	0	0	0	0	0	**2**
3	Mar-01	*Scaridae*	101	16	0	0	0	0	1	**118**
3	Mar-01	*Sphyraenidae*	0	0	0	0	0	1	0	**1**
4	Jun-99	*Chaetodontidae*	0	3	0	0	0	0	0	**3**
4	Jun-99	*Gerreidae*	6	52	3	0	0	0	0	**61**
4	Jun-99	*Haemulidae*	9	37	11	2	0	0	0	**59**
4	Jun-99	*Labridae*	0	1	0	0	0	0	0	**1**
4	Jun-99	*Lutjanidae*	0	24	37	13	10	0	0	**84**
4	Jun-99	*Pomacentridae*	2	0	0	0	0	0	0	**2**
4	Jun-99	*Scaridae*	0	33	1	0	0	0	0	**34**
4	Jun-99	*Sphyraenidae*	0	1	1	0	0	0	0	**2**
4	Jun-99	*Tetraodontidae*	0	0	0	1	6	0	0	**7**
4	Jul-99	*Chaetodontidae*	1	1	0	0	0	0	0	**2**
4	Jul-99	*Gerreidae*	55	8	1	0	0	0	0	**64**
4	Jul-99	*Haemulidae*	0	2	42	1	0	0	0	**45**
4	Jul-99	*Kyphosidae*	0	0	1	0	0	0	0	**1**
4	Jul-99	*Lutjanidae*	4	20	28	22	17	0	0	**91**
4	Jul-99	*Pomacentridae*	4	2	0	0	0	0	0	**6**
4	Jul-99	*Scaridae*	0	1	3	2	0	0	0	**6**
4	Jul-99	*Sphyraenidae*	0	0	0	0	0	1	0	**1**
4	Jul-99	*Tetraodontidae*	0	0	0	17	0	0	0	**17**
4	Aug-99	*Carangidae*	0	0	0	2	0	0	1	**3**
4	Aug-99	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
4	Aug-99	*Gerreidae*	0	2	0	2	0	0	0	**4**
4	Aug-99	*Haemulidae*	2	1	3	0	0	0	0	**6**
4	Aug-99	*Labridae*	0	0	0	1	0	0	0	**1**
4	Aug-99	*Lutjanidae*	0	6	23	11	17	0	0	**57**
4	Aug-99	*Pomacentridae*	9	9	0	0	0	0	0	**18**
4	Aug-99	*Scaridae*	2	2	2	0	0	0	0	**6**
4	Aug-99	*Serranidae*	0	0	1	0	0	0	0	**1**
4	Aug-99	*Tetraodontidae*	0	0	0	0	7	0	0	**7**
4	Oct-99	*Belonidae*	0	0	23	0	0	0	0	**23**
4	Oct-99	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
4	Oct-99	*Gerreidae*	0	14	0	0	0	0	0	**14**
4	Oct-99	*Haemulidae*	0	0	12	2	0	0	0	**14**
4	Oct-99	*Lutjanidae*	2	28	19	10	6	0	0	**65**
4	Oct-99	*Mullidae*	0	0	4	0	0	0	0	**4**
4	Oct-99	*Pomacentridae*	0	2	0	0	0	0	0	**2**
4	Oct-99	*Scaridae*	3	5	1	0	0	0	0	**9**
4	Oct-99	*Serranidae*	0	0	0	1	0	0	0	**1**

4	Oct-99	*Sphyraenidae*	0	2	0	0	0	0	0	**2**
4	Oct-99	*Tetraodontidae*	0	1	0	3	0	0	0	**4**
4	Nov-99	*Chaetodontidae*	2	2	0	0	0	0	0	**4**
4	Nov-99	*Gerreidae*	0	31	0	0	0	0	0	**31**
4	Nov-99	*Haemulidae*	0	1	22	6	0	0	0	**29**
4	Nov-99	*Lutjanidae*	14	21	19	24	6	0	0	**84**
4	Nov-99	*Pomacentridae*	3	2	0	0	0	0	0	**5**
4	Nov-99	*Scaridae*	4	8	0	0	0	0	0	**12**
4	Nov-99	*Scaridae*	0	1	0	2	0	0	0	**3**
4	Nov-99	*Scaridae*	0	1	0	0	0	0	0	**1**
4	Nov-99	*Tetraodontidae*	0	0	0	6	0	0	0	**6**
4	Dec-99	*Gerreidae*	0	1	0	0	0	0	0	**1**
4	Dec-99	*Haemulidae*	0	2	20	3	0	0	0	**25**
4	Dec-99	*Labridae*	1	4	0	0	0	0	0	**5**
4	Dec-99	*Lutjanidae*	0	3	15	11	10	0	0	**39**
4	Dec-99	*Mullidae*	0	0	4	0	0	0	0	**4**
4	Dec-99	*Pomacentridae*	5	0	0	0	0	0	0	**5**
4	Dec-99	*Pomacentridae*	0	2	0	0	0	0	0	**2**
4	Dec-99	*Scaridae*	0	17	1	3	0	0	0	**21**
4	Dec-99	*Sphyraenidae*	0	1	0	1	1	0	1	**4**
4	Dec-99	*Tetraodontidae*	0	0	2	0	0	0	0	**2**
4	Jan-00	*Gerreidae*	0	1	3	0	1	0	0	**5**
4	Jan-00	*Haemulidae*	0	0	10	0	0	0	0	**10**
4	Jan-00	*Labridae*	1	10	0	0	0	0	0	**11**
4	Jan-00	*Lutjanidae*	0	0	21	13	5	0	0	**39**
4	Jan-00	*Pomacentridae*	6	3	0	0	0	0	0	**9**
4	Jan-00	*Scaridae*	22	3	3	2	1	0	0	**31**
4	Jan-00	*Serranidae*	0	0	0	1	0	0	0	**1**
4	Jan-00	*Sphyraenidae*	0	0	0	0	1	0	1	**2**
4	Feb-00	*Chaetodontidae*	2	0	0	0	0	0	0	**2**
4	Feb-00	*Gerreidae*	1	4	24	0	0	0	0	**29**
4	Feb-00	*Haemulidae*	2	18	20	4	0	0	0	**44**
4	Feb-00	*Labridae*	0	2	0	0	0	0	0	**2**
4	Feb-00	*Lutjanidae*	14	21	25	8	14	2	0	**84**
4	Feb-00	*Mullidae*	0	0	2	0	0	0	0	**2**
4	Feb-00	*Pomacentridae*	9	6	0	0	0	0	0	**15**
4	Feb-00	*Scaridae*	4	8	5	2	0	0	0	**19**
4	Feb-00	*Tetraodontidae*	0	0	3	15	0	0	0	**18**
4	Mar-00	*Carangidae*	0	0	0	0	1	0	0	**1**
4	Mar-00	*Chaetodontidae*	4	0	0	0	0	0	0	**4**
4	Mar-00	*Gerreidae*	0	0	12	3	1	0	0	**16**
4	Mar-00	*Haemulidae*	0	2	11	16	7	0	0	**36**
4	Mar-00	*Labridae*	0	3	0	0	0	0	0	**3**
4	Mar-00	*Lutjanidae*	0	0	21	32	7	4	0	**64**
4	Mar-00	*Mullidae*	0	0	0	2	0	0	0	**2**
4	Mar-00	*Pomacentridae*	8	1	0	0	0	0	0	**9**
4	Mar-00	*Scaridae*	1	23	3	2	1	0	0	**30**
4	Mar-00	*Serranidae*	0	0	0	1	0	0	0	**1**
4	Mar-00	*Sphyraenidae*	0	0	0	0	1	1	1	**3**
4	Mar-00	*Tetraodontidae*	0	0	0	21	7	0	0	**28**
4	Apr-00	*Chaetodontidae*	2	0	0	0	0	0	0	**2**
4	Apr-00	*Gerreidae*	2	17	5	0	0	0	0	**24**
4	Apr-00	*Haemulidae*	16	12	27	0	0	0	0	**55**
4	Apr-00	*Labridae*	0	2	0	0	0	0	0	**2**
4	Apr-00	*Lutjanidae*	0	16	25	24	15	2	0	**82**
4	Apr-00	*Mullidae*	0	3	4	1	0	0	0	**8**
4	Apr-00	*Pomacentridae*	2	0	0	0	0	0	0	**2**
4	Apr-00	*Pomacentridae*	5	0	0	0	0	0	0	**5**
4	Apr-00	*Scaridae*	7	17	5	3	0	0	0	**32**
4	Apr-00	*Tetraodontidae*	0	0	0	29	0	0	0	**29**
4	May-00	*Chaetodontidae*	2	0	0	0	0	0	0	**2**
4	May-00	*Gerreidae*	0	1	3	1	0	0	0	**5**
4	May-00	*Haemulidae*	0	12	18	0	0	0	0	**30**
4	May-00	*Lutjanidae*	0	2	36	12	2	0	0	**52**
4	May-00	*Mullidae*	0	0	3	0	0	0	0	**3**
4	May-00	*Pomacentridae*	6	0	0	0	0	0	0	**6**
4	May-00	*Pomacentridae*	3	0	0	0	0	0	0	**3**
4	May-00	*Scaridae*	11	34	0	2	0	0	0	**47**
4	May-00	*Serranidae*	0	0	0	2	0	0	0	**2**
4	May-00	*Tetraodontidae*	0	0	0	8	0	0	0	**8**
4	Jun-00	*Gerreidae*	3	6	1	0	0	0	0	**10**
4	Jun-00	*Haemulidae*	1	3	30	3	0	0	0	**37**
4	Jun-00	*Lutjanidae*	6	11	67	6	0	0	0	**90**
4	Jun-00	*Mullidae*	0	0	3	0	0	0	0	**3**

4	Jun-00	*Pomacentridae*	8	0	0	0	0	0	0	**8**
4	Jun-00	*Scaridae*	15	19	3	0	0	0	0	**37**
4	Jun-00	*Tetraodontidae*	0	0	0	27	0	0	0	**27**
4	Jul-00	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
4	Jul-00	*Gerreidae*	0	3	6	0	0	0	0	**9**
4	Jul-00	*Haemulidae*	0	3	15	6	8	0	0	**32**
4	Jul-00	*Lutjanidae*	0	0	23	19	7	0	0	**49**
4	Jul-00	*Pomacentridae*	7	2	0	0	0	0	0	**9**
4	Jul-00	*Scaridae*	0	11	5	0	1	0	0	**17**
4	Jul-00	*Sphyraenidae*	0	0	0	0	2	0	1	**3**
4	Jul-00	*Tetraodontidae*	0	0	0	0	15	0	0	**15**
4	Aug-00	*Gerreidae*	0	0	1	0	0	0	0	**1**
4	Aug-00	*Haemulidae*	2	0	0	5	3	0	0	**10**
4	Aug-00	*Lutjanidae*	0	1	5	5	0	0	0	**11**
4	Aug-00	*Pomacentridae*	3	1	0	0	0	0	0	**4**
4	Aug-00	*Scaridae*	4	1	2	3	1	0	0	**11**
4	Aug-00	*Sphyraenidae*	0	0	0	1	0	2	0	**3**
4	Oct-00	*Haemulidae*	0	7	37	4	0	0	0	**48**
4	Oct-00	*Lutjanidae*	0	13	56	42	8	0	0	**119**
4	Oct-00	*Mullidae*	0	2	14	0	0	0	0	**16**
4	Oct-00	*Pomacentridae*	7	0	0	0	0	0	0	**7**
4	Oct-00	*Scaridae*	40	27	2	4	0	0	0	**73**
4	Oct-00	*Sphyraenidae*	0	0	1	1	1	0	0	**3**
4	Oct-00	*Tetraodontidae*	0	0	0	5	0	0	0	**5**
4	Nov-00	*Chaetodontidae*	0	1	0	0	0	0	0	**1**
4	Nov-00	*Gerreidae*	0	75	0	0	0	0	0	**75**
4	Nov-00	*Haemulidae*	0	14	26	10	0	0	0	**50**
4	Nov-00	*Lutjanidae*	0	9	71	51	10	1	0	**142**
4	Nov-00	*Mullidae*	0	0	3	0	0	0	0	**3**
4	Nov-00	*Pomacentridae*	0	5	0	0	0	0	0	**5**
4	Nov-00	*Scaridae*	20	21	12	0	0	0	0	**53**
4	Nov-00	*Tetraodontidae*	0	0	0	0	25	0	0	**25**
4	Dec-00	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
4	Dec-00	*Gerreidae*	0	0	2	0	0	0	0	**2**
4	Dec-00	*Haemulidae*	0	5	20	6	0	0	0	**31**
4	Dec-00	*Labridae*	2	0	0	0	0	0	0	**2**
4	Dec-00	*Lutjanidae*	1	0	22	35	14	0	0	**72**
4	Dec-00	*Mullidae*	0	0	0	2	0	0	0	**2**
4	Dec-00	*Pomacentridae*	4	6	0	0	0	0	0	**10**
4	Dec-00	*Scaridae*	24	11	2	0	0	0	0	**37**
4	Dec-00	*Sphyraenidae*	0	0	0	1	0	0	0	**1**
4	Jan-01	*Gerreidae*	0	0	1	0	0	0	0	**1**
4	Jan-01	*Haemulidae*	0	6	4	14	0	0	0	**24**
4	Jan-01	*Labridae*	0	0	1	0	0	0	0	**1**
4	Jan-01	*Lutjanidae*	1	0	14	21	2	0	0	**38**
4	Jan-01	*Mullidae*	0	0	1	8	2	0	0	**11**
4	Jan-01	*Pomacentridae*	0	5	0	0	0	0	0	**5**
4	Jan-01	*Scaridae*	0	1	3	0	0	0	0	**4**
4	Jan-01	*Sphyraenidae*	0	0	0	0	2	0	0	**2**
4	Jan-01	*Tetraodontidae*	0	0	0	1	1	1	0	**3**
4	Feb-01	*Gerreidae*	0	6	1	0	0	0	0	**7**
4	Feb-01	*Haemulidae*	0	9	6	7	0	0	0	**22**
4	Feb-01	*Lutjanidae*	0	0	29	53	1	0	0	**83**
4	Feb-01	*Mullidae*	0	0	3	1	0	0	0	**4**
4	Feb-01	*Pomacentridae*	2	4	0	0	0	0	0	**6**
4	Feb-01	*Scaridae*	3	7	10	0	0	0	0	**20**
4	Feb-01	*Tetraodontidae*	0	0	0	3	4	0	0	**7**
4	Mar-01	*Gerreidae*	0	0	1	0	0	0	0	**1**
4	Mar-01	*Haemulidae*	0	0	19	11	0	0	0	**30**
4	Mar-01	*Labridae*	0	1	0	0	0	0	0	**1**
4	Mar-01	*Lutjanidae*	0	0	2	8	1	0	0	**11**
4	Mar-01	*Mullidae*	0	0	2	5	0	0	0	**7**
4	Mar-01	*Pomacentridae*	3	1	0	0	0	0	0	**4**
4	Mar-01	*Scaridae*	9	9	4	2	0	0	0	**24**
4	Mar-01	*Sphyraenidae*	0	0	0	0	1	1	0	**2**
4	Mar-01	*Tetraodontidae*	0	0	0	0	5	0	0	**5**
5	Jun-99	*Belonidae*	0	0	0	1	0	0	0	**1**
5	Jun-99	*Gerreidae*	20	2	3	0	0	0	0	**25**
5	Jun-99	*Haemulidae*	0	0	1	0	0	0	0	**1**
5	Jun-99	*Labridae*	1	2	0	0	0	0	0	**3**
5	Jun-99	*Lutjanidae*	1	22	18	1	0	0	0	**42**
5	Jun-99	*Scaridae*	0	58	0	0	0	0	0	**58**
5	Jun-99	*Sphyraenidae*	0	0	0	0	1	1	0	**2**
5	Jul-99	*Gerreidae*	16	5	0	0	0	0	0	**21**

5	Jul-99	*Haemulidae*	0	3	8	1	0	0	0	12
5	Jul-99	*Labridae*	1	3	0	0	0	0	0	4
5	Jul-99	*Lutjanidae*	2	16	15	1	0	0	0	34
5	Jul-99	*Scaridae*	0	41	0	0	0	0	0	41
5	Jul-99	*Sphyraenidae*	0	0	0	0	1	0	0	1
5	Aug-99	*Gerreidae*	0	8	4	0	0	0	0	12
5	Aug-99	*Haemulidae*	0	5	11	2	0	0	0	18
5	Aug-99	*Labridae*	0	4	0	0	0	0	0	4
5	Aug-99	*Lutjanidae*	3	12	19	1	0	0	0	35
5	Aug-99	*Mullidae*	0	0	7	0	0	0	0	7
5	Aug-99	*Pomacentridae*	1	1	0	0	0	0	0	2
5	Aug-99	*Scaridae*	0	36	10	0	0	0	0	46
5	Aug-99	*Sphyraenidae*	0	0	0	1	1	0	0	2
5	Oct-99	*Gerreidae*	0	1	0	0	0	0	0	1
5	Oct-99	*Labridae*	3	0	0	0	0	0	0	3
5	Oct-99	*Lutjanidae*	5	6	0	0	0	0	0	11
5	Oct-99	*Mullidae*	0	1	0	0	0	0	0	1
5	Oct-99	*Pomacentridae*	10	0	0	0	0	0	0	10
5	Oct-99	*Scaridae*	1	0	0	0	0	0	0	1
5	Oct-99	*Sphyraenidae*	0	1	0	0	0	0	0	1
5	Nov-99	*Chaetodontidae*	2	0	0	0	0	0	0	2
5	Nov-99	*Labridae*	1	1	0	0	0	0	0	2
5	Nov-99	*Lutjanidae*	10	4	4	0	0	0	0	18
5	Dec-99	*Carangidae*	0	0	0	1	0	0	0	1
5	Dec-99	*Chaetodontidae*	1	0	0	0	0	0	0	1
5	Dec-99	*Gerreidae*	12	0	0	0	0	0	0	12
5	Dec-99	*Labridae*	0	2	0	0	0	0	0	2
5	Dec-99	*Lutjanidae*	8	0	0	0	0	0	0	8
5	Dec-99	*Pomacentridae*	1	2	0	0	0	0	0	3
5	Dec-99	*Scaridae*	1	17	0	0	0	0	0	18
5	Dec-99	*Sphyraenidae*	0	0	0	1	0	1	0	2
5	Jan-00	*Gerreidae*	22	0	5	0	0	0	0	27
5	Jan-00	*Haemulidae*	0	0	5	0	0	0	0	5
5	Jan-00	*Labridae*	0	9	0	1	0	0	0	10
5	Jan-00	*Lutjanidae*	0	0	3	0	0	0	0	3
5	Jan-00	*Mullidae*	0	1	0	1	0	0	0	2
5	Jan-00	*Pomacentridae*	0	1	0	0	0	0	0	1
5	Jan-00	*Scaridae*	4	3	2	1	0	0	0	10
5	Jan-00	*Sphyraenidae*	0	0	0	0	1	0	0	1
5	Feb-00	*Gerreidae*	31	0	2	1	0	0	0	34
5	Feb-00	*Haemulidae*	0	0	0	1	0	0	0	1
5	Feb-00	*Labridae*	0	10	0	1	0	0	0	11
5	Feb-00	*Lutjanidae*	0	6	6	4	1	0	0	17
5	Feb-00	*Mullidae*	0	1	0	1	0	0	0	2
5	Feb-00	*Pomacentridae*	1	0	0	0	0	0	0	1
5	Feb-00	*Scaridae*	0	18	5	0	0	0	0	23
5	Feb-00	*Sphyraenidae*	0	0	0	0	1	0	0	1
5	Mar-00	*Gerreidae*	0	0	1	0	0	0	0	1
5	Mar-00	*Labridae*	0	7	0	0	0	0	0	7
5	Mar-00	*Lutjanidae*	1	4	1	0	0	0	0	6
5	Mar-00	*Mullidae*	0	1	0	0	0	0	0	1
5	Mar-00	*Pomacentridae*	2	2	0	0	0	0	0	4
5	Mar-00	*Scaridae*	10	3	0	0	0	0	0	13
5	Mar-00	*Sphyraenidae*	0	0	0	0	1	0	0	1
5	Apr-00	*Gerreidae*	6	0	0	0	0	0	0	6
5	Apr-00	*Labridae*	2	0	0	0	0	0	0	2
5	Apr-00	*Lutjanidae*	11	6	0	0	0	0	0	17
5	Apr-00	*Mullidae*	0	1	0	0	0	0	0	1
5	Apr-00	*Pomacentridae*	6	0	0	0	0	0	0	6
5	Apr-00	*Scaridae*	1	17	0	0	0	0	0	18
5	Apr-00	*Sphyraenidae*	0	0	0	0	1	0	0	1
5	May-00	*Chaetodontidae*	2	0	0	0	0	0	0	2
5	May-00	*Gerreidae*	2	0	1	1	0	0	0	4
5	May-00	*Haemulidae*	1	0	1	2	0	0	0	4
5	May-00	*Labridae*	0	5	2	0	0	0	0	7
5	May-00	*Lutjanidae*	0	4	2	4	0	0	0	10
5	May-00	*Pomacentridae*	3	2	0	0	0	0	0	5
5	May-00	*Scaridae*	0	8	1	0	0	0	0	9
5	May-00	*Sphyraenidae*	0	1	0	0	1	1	1	4
5	Jun-00	*Chaetodontidae*	1	0	0	0	0	0	0	1
5	Jun-00	*Gerreidae*	48	3	4	0	0	0	0	55
5	Jun-00	*Haemulidae*	2	0	1	0	0	0	0	3
5	Jun-00	*Labridae*	4	0	0	0	0	0	0	4
5	Jun-00	*Lutjanidae*	4	11	2	0	0	0	0	17

5	Jun-00	*Pomacentridae*	5	0	0	0	0	0	0	**5**
5	Jun-00	*Scaridae*	20	1	0	0	0	0	0	**21**
5	Jun-00	*Sphyraenidae*	2	0	0	0	0	0	0	**2**
5	Jul-00	*Chaetodontidae*	2	0	0	0	0	0	0	**2**
5	Jul-00	*Gerreidae*	0	2	7	2	0	0	0	**11**
5	Jul-00	*Haemulidae*	0	4	21	7	0	0	0	**32**
5	Jul-00	*Lutjanidae*	0	11	24	7	0	0	0	**42**
5	Jul-00	*Ostraciidae*	0	0	0	0	1	0	0	**1**
5	Jul-00	*Pomacentridae*	1	0	0	0	0	0	0	**1**
5	Jul-00	*Scaridae*	2	5	9	0	0	0	0	**16**
5	Jul-00	*Sphyraenidae*	0	0	0	0	1	0	0	**1**
5	Aug-00	*Gerreidae*	0	29	0	0	0	0	0	**29**
5	Aug-00	*Haemulidae*	0	0	6	8	1	0	0	**15**
5	Aug-00	*Lutjanidae*	0	2	5	4	1	0	0	**12**
5	Aug-00	*Mullidae*	0	0	2	1	0	0	0	**3**
5	Aug-00	*Pomacentridae*	1	0	0	0	0	0	0	**1**
5	Aug-00	*Scaridae*	46	115	0	1	0	0	0	**162**
5	Aug-00	*Sphyraenidae*	0	0	1	0	0	0	0	**1**
5	Oct-00	*Chaetodontidae*	3	0	0	0	0	0	0	**3**
5	Oct-00	*Gerreidae*	9	4	3	0	0	0	0	**16**
5	Oct-00	*Haemulidae*	0	0	25	2	0	0	0	**27**
5	Oct-00	*Labridae*	0	2	0	0	0	0	0	**2**
5	Oct-00	*Lutjanidae*	1	14	6	0	0	0	0	**21**
5	Oct-00	*Mullidae*	0	0	3	14	0	0	0	**17**
5	Oct-00	*Pomacentridae*	3	0	0	0	0	0	0	**3**
5	Oct-00	*Scaridae*	0	0	4	0	0	0	0	**4**
5	Oct-00	*Sphyraenidae*	0	0	1	0	1	1	0	**3**
5	Nov-00	*Chaetodontidae*	0	1	0	0	0	0	0	**1**
5	Nov-00	*Gerreidae*	0	16	0	0	0	0	0	**16**
5	Nov-00	*Lutjanidae*	3	3	7	0	0	0	0	**13**
5	Nov-00	*Mullidae*	0	0	1	0	0	0	0	**1**
5	Nov-00	*Pomacentridae*	3	0	0	0	0	0	0	**3**
5	Nov-00	*Scaridae*	0	0	1	0	0	0	0	**1**
5	Dec-00	*Gerreidae*	0	0	4	0	0	0	0	**4**
5	Dec-00	*Haemulidae*	0	0	0	9	1	0	0	**10**
5	Dec-00	*Labridae*	0	1	0	0	0	0	0	**1**
5	Dec-00	*Lutjanidae*	0	5	4	12	0	0	0	**21**
5	Dec-00	*Mullidae*	0	0	0	6	0	0	0	**6**
5	Dec-00	*Scaridae*	0	0	12	0	0	0	0	**12**
5	Dec-00	*Sphyraenidae*	0	0	0	0	1	0	0	**1**
5	Jan-01	*Gerreidae*	0	0	1	0	0	0	0	**1**
5	Jan-01	*Lutjanidae*	0	1	8	0	0	0	0	**9**
5	Jan-01	*Scaridae*	0	0	1	0	0	0	0	**1**
5	Jan-01	*Sphyraenidae*	0	0	0	0	0	1	0	**1**
5	Jan-01	*Tetraodontidae*	0	0	0	0	1	0	0	**1**
5	Feb-01	*Labridae*	0	1	0	0	0	0	0	**1**
5	Feb-01	*Lutjanidae*	1	0	0	0	0	0	0	**1**
5	Feb-01	*Pomacentridae*	1	0	0	0	0	0	0	**1**
5	Feb-01	*Scaridae*	3	7	0	0	0	0	0	**10**
5	Feb-01	*Sphyraenidae*	0	0	0	0	1	1	0	**2**
5	Mar-01	*Gerreidae*	0	0	0	1	0	0	0	**1**
5	Mar-01	*Labridae*	0	2	0	0	0	0	0	**2**
5	Mar-01	*Lutjanidae*	0	0	1	0	0	0	0	**1**
5	Mar-01	*Pomacentridae*	1	1	0	0	0	0	0	**2**
5	Mar-01	*Scaridae*	3	2	4	0	0	0	0	**9**
5	Mar-01	*Sphyraenidae*	0	0	0	0	0	1	0	**1**
6	Jun-99	*Gerreidae*	0	6	0	0	0	0	0	**6**
6	Jun-99	*Haemulidae*	0	1	3	6	0	0	0	**10**
6	Jun-99	*Labridae*	0	2	0	0	0	0	0	**2**
6	Jun-99	*Lutjanidae*	3	23	57	34	0	0	0	**117**
6	Jun-99	*Mullidae*	0	3	0	0	0	0	0	**3**
6	Jun-99	*Pomacentridae*	2	7	0	0	0	0	0	**9**
6	Jun-99	*Scaridae*	5	48	0	0	0	0	0	**53**
6	Jun-99	*Sphyraenidae*	1	0	0	0	0	0	0	**1**
6	Jul-99	*Acanthuridae*	3	0	0	0	0	0	0	**3**
6	Jul-99	*Chaetodontidae*	0	2	0	0	0	0	0	**2**
6	Jul-99	*Gerreidae*	3	0	0	0	0	0	0	**3**
6	Jul-99	*Haemulidae*	0	0	0	15	9	0	0	**24**
6	Jul-99	*Labridae*	0	2	0	0	0	0	0	**2**
6	Jul-99	*Lutjanidae*	0	4	5	16	2	0	0	**27**
6	Jul-99	*Mullidae*	0	0	5	0	0	0	0	**5**
6	Jul-99	*Pomacentridae*	6	3	0	0	0	0	0	**9**
6	Jul-99	*Scaridae*	53	49	8	1	0	0	0	**111**
6	Jul-99	*Sphyraenidae*	0	0	1	0	0	0	0	**1**

6	Jul-99	*Tetraodontidae*	0	0	0	1	0	0	0	1
6	Aug-99	*Chaetodontidae*	1	0	0	0	0	0	0	1
6	Aug-99	*Gerreidae*	0	0	1	0	0	0	0	1
6	Aug-99	*Haemulidae*	0	2	3	0	0	0	0	5
6	Aug-99	*Labridae*	0	1	0	0	0	0	0	1
6	Aug-99	*Lutjanidae*	0	6	7	9	0	0	0	22
6	Aug-99	*Pomacentridae*	2	6	0	0	0	0	0	8
6	Aug-99	*Scaridae*	40	27	0	0	0	0	0	67
6	Aug-99	*Sphyraenidae*	0	0	0	3	0	0	1	4
6	Oct-99	*Chaetodontidae*	4	0	0	0	0	0	0	4
6	Oct-99	*Gerreidae*	0	4	0	0	0	0	0	4
6	Oct-99	*Lutjanidae*	36	58	0	0	0	0	0	94
6	Oct-99	*Pomacentridae*	7	1	0	0	0	0	0	8
6	Oct-99	*Scaridae*	32	1	0	0	0	0	0	33
6	Oct-99	*Tetraodontidae*	0	0	0	2	0	0	0	2
6	Nov-99	*Gerreidae*	0	1	0	0	0	0	0	1
6	Nov-99	*Lutjanidae*	7	8	0	0	0	0	0	15
6	Nov-99	*Pomacentridae*	1	0	0	0	0	0	0	1
6	Nov-99	*Scaridae*	5	0	0	0	0	0	0	5
6	Nov-99	*Sphyraenidae*	0	0	0	1	0	0	0	1
6	Dec-99	*Labridae*	0	1	0	0	0	0	0	1
6	Dec-99	*Lutjanidae*	1	2	1	0	0	0	0	4
6	Dec-99	*Pomacentridae*	1	0	0	0	0	0	0	1
6	Dec-99	*Scaridae*	12	1	0	0	0	0	0	13
6	Dec-99	*Tetraodontidae*	0	0	0	1	0	0	0	1
6	Jan-00	*Chaetodontidae*	0	1	0	0	0	0	0	1
6	Jan-00	*Gerreidae*	0	1	0	0	0	0	0	1
6	Jan-00	*Haemulidae*	1	1	2	0	0	0	0	4
6	Jan-00	*Labridae*	2	9	0	0	0	0	0	11
6	Jan-00	*Lutjanidae*	0	2	39	2	0	0	0	43
6	Jan-00	*Pomacentridae*	2	4	0	0	0	0	0	6
6	Jan-00	*Scaridae*	47	13	11	0	0	0	0	71
6	Jan-00	*Sphyraenidae*	0	0	0	0	1	0	0	1
6	Feb-00	*Haemulidae*	0	0	1	0	0	0	0	1
6	Feb-00	*Labridae*	0	5	0	0	0	0	0	5
6	Feb-00	*Lutjanidae*	0	0	8	15	0	0	0	23
6	Feb-00	*Pomacentridae*	0	1	0	0	0	0	0	1
6	Feb-00	*Scaridae*	31	18	5	0	0	0	0	54
6	Feb-00	*Sphyraenidae*	0	0	0	0	1	0	0	1
6	Mar-00	*Chaetodontidae*	2	0	0	0	0	0	0	2
6	Mar-00	*Gerreidae*	0	0	1	0	0	0	0	1
6	Mar-00	*Lutjanidae*	0	2	10	6	0	0	0	18
6	Mar-00	*Pomacentridae*	3	4	0	0	0	0	0	7
6	Mar-00	*Scaridae*	4	10	0	0	0	0	0	14
6	Mar-00	*Tetraodontidae*	0	0	0	1	3	0	0	4
6	Apr-00	*Chaetodontidae*	1	0	0	0	0	0	0	1
6	Apr-00	*Gobiidae*	2	0	0	0	0	0	0	2
6	Apr-00	*Haemulidae*	0	0	2	0	0	0	0	2
6	Apr-00	*Labridae*	1	8	0	0	0	0	0	9
6	Apr-00	*Lutjanidae*	0	7	8	1	0	0	0	16
6	Apr-00	*Mullidae*	0	1	0	0	0	0	0	1
6	Apr-00	*Pomacentridae*	15	2	0	0	0	0	0	17
6	Apr-00	*Scaridae*	34	50	6	0	0	0	0	90
6	May-00	*Chaetodontidae*	1	0	0	0	0	0	0	1
6	May-00	*Gerreidae*	0	1	2	0	0	0	0	3
6	May-00	*Haemulidae*	1	0	0	1	0	0	0	2
6	May-00	*Labridae*	0	2	0	0	0	0	0	2
6	May-00	*Lutjanidae*	5	10	39	43	6	0	0	103
6	May-00	*Pomacentridae*	1	5	0	0	0	0	0	6
6	May-00	*Scaridae*	40	32	1	1	0	0	0	74
6	May-00	*Tetraodontidae*	0	0	0	1	0	0	0	1
6	Jun-00	*Gerreidae*	0	4	0	0	0	0	0	4
6	Jun-00	*Haemulidae*	0	0	17	0	0	0	0	17
6	Jun-00	*Lutjanidae*	8	21	68	45	0	0	0	142
6	Jun-00	*Pomacentridae*	11	4	0	0	0	0	0	15
6	Jun-00	*Scaridae*	11	8	1	3	0	0	0	23
6	Jul-00	*Chaetodontidae*	2	0	0	0	0	0	0	2
6	Jul-00	*Gerreidae*	0	3	1	0	0	0	0	4
6	Jul-00	*Haemulidae*	1	0	2	3	0	0	0	6
6	Jul-00	*Labridae*	1	0	0	0	0	0	0	1
6	Jul-00	*Lutjanidae*	0	0	20	18	3	0	0	41
6	Jul-00	*Pomacentridae*	3	3	0	0	0	0	0	6
6	Jul-00	*Scaridae*	27	1	3	0	0	0	0	31
6	Aug-00	*Lutjanidae*	0	1	2	4	0	0	0	7

6	Aug-00	*Pomacentridae*	3	9	0	0	0	0	0	**12**
6	Aug-00	*Scaridae*	7	0	1	0	0	0	0	**8**
6	Aug-00	*Tetraodontidae*	0	0	0	0	1	0	0	**1**
6	Oct-00	*Haemulidae*	0	0	13	0	0	0	0	**13**
6	Oct-00	*Labridae*	5	0	0	0	0	0	0	**5**
6	Oct-00	*Lutjanidae*	0	3	21	2	0	0	0	**26**
6	Oct-00	*Mullidae*	0	4	0	0	0	0	0	**4**
6	Oct-00	*Pomacentridae*	5	0	0	0	0	0	0	**5**
6	Oct-00	*Scaridae*	95	19	0	0	0	0	0	**114**
6	Nov-00	*Albulidae*	0	0	0	0	0	0	1	**1**
6	Nov-00	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
6	Nov-00	*Gerreidae*	0	0	0	0	4	0	0	**4**
6	Nov-00	*Ostraciidae*	0	0	0	0	1	0	0	**1**
6	Nov-00	*Pomacentridae*	0	1	0	0	0	0	0	**1**
6	Nov-00	*Sphyraenidae*	0	0	0	0	0	0	2	**2**
6	Dec-00	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
6	Dec-00	*Haemulidae*	0	0	1	1	0	0	0	**2**
6	Dec-00	*Labridae*	0	10	2	0	0	0	0	**12**
6	Dec-00	*Lutjanidae*	0	0	0	12	1	0	0	**13**
6	Dec-00	*Mullidae*	0	0	3	0	0	0	0	**3**
6	Dec-00	*Pomacentridae*	1	4	0	0	0	0	0	**5**
6	Dec-00	*Scaridae*	28	145	17	3	0	0	0	**193**
6	Jan-01	*Haemulidae*	0	0	2	2	1	0	0	**5**
6	Jan-01	*Labridae*	0	5	0	0	0	0	0	**5**
6	Jan-01	*Lutjanidae*	0	0	5	14	0	0	0	**19**
6	Jan-01	*Mullidae*	0	0	1	1	0	0	0	**2**
6	Jan-01	*Pomacentridae*	8	5	0	0	0	0	0	**13**
6	Jan-01	*Scaridae*	59	65	2	0	0	0	0	**126**
6	Feb-01	*Gerreidae*	0	0	1	0	0	0	0	**1**
6	Feb-01	*Haemulidae*	0	0	0	2	0	0	0	**2**
6	Feb-01	*Labridae*	0	1	1	0	0	0	0	**2**
6	Feb-01	*Lutjanidae*	1	0	2	24	3	0	0	**30**
6	Feb-01	*Pomacentridae*	2	4	0	0	0	0	0	**6**
6	Feb-01	*Scaridae*	14	81	7	0	0	0	0	**102**
6	Mar-01	*Chaetodontidae*	1	1	0	0	0	0	0	**2**
6	Mar-01	*Haemulidae*	0	0	2	1	2	0	0	**5**
6	Mar-01	*Labridae*	0	4	0	0	0	0	0	**4**
6	Mar-01	*Lutjanidae*	0	0	4	31	4	0	0	**39**
6	Mar-01	*Pomacentridae*	4	3	0	0	0	0	0	**7**
6	Mar-01	*Scaridae*	0	41	1	1	0	0	0	**43**
6	Mar-01	*Sphyraenidae*	0	0	0	0	0	0	1	**1**
7	Jun-99	*Acanthuridae*	0	1	0	0	0	0	0	**1**
7	Jun-99	*Chaetodontidae*	0	1	0	0	0	0	0	**1**
7	Jun-99	*Gerreidae*	1	2	0	0	0	0	0	**3**
7	Jun-99	*Gobiidae*	1	0	0	0	0	0	0	**1**
7	Jun-99	*Haemulidae*	0	21	0	0	0	0	0	**21**
7	Jun-99	*Labridae*	2	0	0	0	0	0	0	**2**
7	Jun-99	*Lutjanidae*	1	22	45	2	0	0	0	**70**
7	Jun-99	*Pomacentridae*	8	2	0	0	0	0	0	**10**
7	Jun-99	*Scaridae*	21	1	1	0	0	0	0	**23**
7	Jun-99	*Sphyraenidae*	1	0	0	0	0	0	0	**1**
7	Jul-99	*Chaetodontidae*	2	0	0	0	0	0	0	**2**
7	Jul-99	*Haemulidae*	1	34	10	10	0	0	0	**55**
7	Jul-99	*Labridae*	0	2	0	0	0	0	0	**2**
7	Jul-99	*Lutjanidae*	1	6	19	66	16	0	0	**108**
7	Jul-99	*Pomacentridae*	9	1	0	0	0	0	0	**10**
7	Jul-99	*Scaridae*	13	8	0	3	0	0	0	**24**
7	Jul-99	*Sphyraenidae*	0	0	0	0	1	0	0	**1**
7	Jul-99	*Tetraodontidae*	0	0	0	5	0	0	0	**5**
7	Aug-99	*Gerreidae*	0	0	0	3	0	0	0	**3**
7	Aug-99	*Haemulidae*	4	38	3	0	0	0	0	**45**
7	Aug-99	*Labridae*	0	0	1	0	0	0	0	**1**
7	Aug-99	*Lutjanidae*	0	2	24	46	34	0	0	**106**
7	Aug-99	*Mullidae*	0	2	0	0	0	0	0	**2**
7	Aug-99	*Pomacentridae*	4	0	0	0	0	0	0	**4**
7	Aug-99	*Scaridae*	19	0	0	1	1	0	0	**21**
7	Aug-99	*Sphyraenidae*	0	2	0	0	0	0	0	**2**
7	Oct-99	*Gerreidae*	0	22	0	0	0	0	0	**22**
7	Oct-99	*Haemulidae*	4	0	7	0	0	0	0	**11**
7	Oct-99	*Lutjanidae*	11	54	36	40	1	0	0	**142**
7	Oct-99	*Mullidae*	0	1	2	0	0	0	0	**3**
7	Oct-99	*Pomacentridae*	2	5	0	0	0	0	0	**7**
7	Oct-99	*Scaridae*	8	4	0	4	0	0	0	**16**
7	Oct-99	*Sphyraenidae*	0	1	0	1	0	0	0	**2**

7	Oct-99	*Tetraodontidae*	0	0	1	0	0	0	0	1
7	Nov-99	*Chaetodontidae*	1	0	0	0	0	0	0	1
7	Nov-99	*Gerreidae*	0	7	6	0	0	0	0	13
7	Nov-99	*Haemulidae*	8	13	22	0	0	0	0	43
7	Nov-99	*Lutjanidae*	4	10	66	38	6	0	0	124
7	Nov-99	*Mullidae*	0	2	4	0	0	0	0	6
7	Nov-99	*Pomacentridae*	2	2	0	0	0	0	0	4
7	Nov-99	*Scaridae*	5	3	1	2	0	0	0	11
7	Nov-99	*Sphyraenidae*	0	0	0	2	0	0	0	2
7	Dec-99	*Acanthuridae*	1	0	0	0	0	0	0	1
7	Dec-99	*Carangidae*	0	0	3	0	0	0	0	3
7	Dec-99	*Chaetodontidae*	0	3	0	0	0	0	0	3
7	Dec-99	*Gerreidae*	8	5	7	0	0	0	0	20
7	Dec-99	*Haemulidae*	0	0	5	30	0	0	0	35
7	Dec-99	*Labridae*	1	1	0	0	0	0	0	2
7	Dec-99	*Lutjanidae*	10	9	41	55	0	0	0	115
7	Dec-99	*Mullidae*	0	4	0	0	0	0	0	4
7	Dec-99	*Pomacentridae*	0	2	0	0	0	0	0	2
7	Dec-99	*Scaridae*	11	10	13	3	0	0	0	37
7	Dec-99	*Sphyraenidae*	0	0	1	0	1	1	1	4
7	Dec-99	*Tetraodontidae*	0	1	0	1	1	0	0	3
7	Jan-00	*Chaetodontidae*	0	1	0	0	0	0	0	1
7	Jan-00	*Gerreidae*	0	0	9	0	0	0	0	9
7	Jan-00	*Haemulidae*	11	12	41	0	0	0	0	64
7	Jan-00	*Labridae*	0	2	0	0	0	0	0	2
7	Jan-00	*Lutjanidae*	0	3	44	55	0	0	0	102
7	Jan-00	*Mullidae*	0	0	0	2	0	0	0	2
7	Jan-00	*Pomacentridae*	0	3	0	0	0	0	0	3
7	Jan-00	*Scaridae*	12	6	1	1	0	0	0	20
7	Jan-00	*Serranidae*	0	0	0	1	0	0	0	1
7	Jan-00	*Sphyraenidae*	0	0	0	0	1	1	0	2
7	Feb-00	*Chaetodontidae*	1	2	0	0	0	0	0	3
7	Feb-00	*Gerreidae*	0	0	3	0	1	0	0	4
7	Feb-00	*Haemulidae*	6	7	24	25	0	0	0	62
7	Feb-00	*Labridae*	0	0	1	0	0	0	0	1
7	Feb-00	*Lutjanidae*	0	0	21	57	7	0	0	85
7	Feb-00	*Mullidae*	0	2	11	1	0	0	0	14
7	Feb-00	*Pomacentridae*	0	2	0	1	0	0	0	3
7	Feb-00	*Scaridae*	19	22	5	2	4	0	0	52
7	Feb-00	*Sphyraenidae*	0	0	0	0	1	0	0	1
7	Mar-00	*Acanthuridae*	0	1	0	0	0	0	0	1
7	Mar-00	*Chaetodontidae*	4	0	0	0	0	0	0	4
7	Mar-00	*Gerreidae*	0	6	8	0	0	0	0	14
7	Mar-00	*Haemulidae*	2	6	56	6	0	0	0	70
7	Mar-00	*Lutjanidae*	2	8	39	61	5	0	0	115
7	Mar-00	*Mullidae*	0	0	1	2	0	0	0	3
7	Mar-00	*Pomacentridae*	3	0	0	1	0	0	0	4
7	Mar-00	*Scaridae*	3	0	1	0	2	0	0	6
7	Mar-00	*Sphyraenidae*	0	0	0	1	0	0	0	1
7	Apr-00	*Acanthuridae*	1	1	0	0	0	0	0	2
7	Apr-00	*Chaetodontidae*	4	0	0	0	0	0	0	4
7	Apr-00	*Gerreidae*	1	13	0	0	0	0	0	14
7	Apr-00	*Haemulidae*	10	15	47	0	0	0	0	72
7	Apr-00	*Lutjanidae*	3	15	140	6	0	0	0	164
7	Apr-00	*Pomacentridae*	2	4	0	0	0	0	0	6
7	Apr-00	*Scaridae*	11	0	0	0	0	0	0	11
7	Apr-00	*Serranidae*	0	0	0	0	1	0	0	1
7	Apr-00	*Sphyraenidae*	0	0	0	0	0	1	0	1
7	May-00	*Acanthuridae*	0	0	1	0	0	0	0	1
7	May-00	*Chaetodontidae*	1	0	0	0	0	0	0	1
7	May-00	*Gerreidae*	19	55	1	0	0	0	0	75
7	May-00	*Haemulidae*	14	23	81	10	0	0	0	128
7	May-00	*Lutjanidae*	8	26	50	45	5	0	0	134
7	May-00	*Mullidae*	0	1	0	0	0	0	0	1
7	May-00	*Pomacentridae*	5	0	1	0	0	0	0	6
7	May-00	*Scaridae*	28	0	0	1	0	0	0	29
7	May-00	*Sphyraenidae*	2	0	0	0	1	0	0	3
7	May-00	*Tetraodontidae*	0	0	0	1	0	0	0	1
7	Jun-00	*Gerreidae*	13	5	1	0	0	0	0	19
7	Jun-00	*Haemulidae*	35	42	22	0	0	0	0	99
7	Jun-00	*Labridae*	2	0	0	0	0	0	0	2
7	Jun-00	*Lutjanidae*	5	35	94	28	0	0	0	162
7	Jun-00	*Pomacentridae*	6	0	1	0	0	0	0	7
7	Jun-00	*Scaridae*	4	0	0	2	0	0	0	6

7	Jun-00	*Serranidae*	0	0	1	0	0	0	0	**1**
7	Jun-00	*Sphyraenidae*	0	0	0	1	0	0	0	**1**
7	Jul-00	*Acanthuridae*	0	0	1	0	0	0	0	**1**
7	Jul-00	*Gerreidae*	1	43	1	0	0	0	0	**45**
7	Jul-00	*Haemulidae*	4	42	18	14	0	0	0	**78**
7	Jul-00	*Labridae*	2	0	0	0	0	0	0	**2**
7	Jul-00	*Lutjanidae*	0	15	71	60	5	1	0	**152**
7	Jul-00	*Mullidae*	0	0	0	2	0	0	0	**2**
7	Jul-00	*Pomacentridae*	13	4	1	0	0	0	0	**18**
7	Jul-00	*Scaridae*	7	0	0	0	0	0	0	**7**
7	Jul-00	*Serranidae*	0	0	0	1	0	0	0	**1**
7	Jul-00	*Sphyraenidae*	0	0	0	3	1	0	1	**5**
7	Aug-00	*Acanthuridae*	0	0	1	0	0	0	0	**1**
7	Aug-00	*Gerreidae*	0	0	34	4	0	0	0	**38**
7	Aug-00	*Haemulidae*	0	20	60	5	0	0	0	**85**
7	Aug-00	*Labridae*	0	1	0	0	0	0	0	**1**
7	Aug-00	*Lutjanidae*	1	6	55	36	6	0	0	**104**
7	Aug-00	*Mullidae*	0	0	1	0	0	0	0	**1**
7	Aug-00	*Pomacanthidae*	1	4	1	0	0	0	0	**6**
7	Aug-00	*Scaridae*	23	1	0	2	0	0	0	**26**
7	Aug-00	*Serranidae*	0	1	0	0	0	0	0	**1**
7	Aug-00	*Sphyraenidae*	0	0	2	2	0	0	0	**4**
7	Oct-00	*Gerreidae*	0	7	17	0	0	0	0	**24**
7	Oct-00	*Haemulidae*	0	34	56	0	0	0	0	**90**
7	Oct-00	*Labridae*	6	1	0	0	0	0	0	**7**
7	Oct-00	*Lutjanidae*	1	29	102	27	4	0	0	**163**
7	Oct-00	*Mullidae*	0	0	21	0	0	0	0	**21**
7	Oct-00	*Pomacentridae*	5	1	0	0	0	0	0	**6**
7	Oct-00	*Scaridae*	14	7	1	0	0	0	0	**22**
7	Oct-00	*Sparidae*	0	0	1	0	0	0	0	**1**
7	Oct-00	*Sphyraenidae*	0	0	0	1	1	0	0	**2**
7	Oct-00	*Tetraodontidae*	0	0	1	0	1	0	0	**2**
7	Nov-00	*Acanthuridae*	0	0	1	0	0	0	0	**1**
7	Nov-00	*Chaetodontidae*	0	1	0	0	0	0	0	**1**
7	Nov-00	*Gerreidae*	2	33	1	0	0	0	0	**36**
7	Nov-00	*Haemulidae*	10	24	74	3	0	0	0	**111**
7	Nov-00	*Labridae*	13	0	0	0	0	0	0	**13**
7	Nov-00	*Lutjanidae*	2	10	61	64	0	0	0	**137**
7	Nov-00	*Mullidae*	0	0	11	0	0	0	0	**11**
7	Nov-00	*Pomacentridae*	8	15	0	0	0	0	0	**23**
7	Nov-00	*Scaridae*	37	6	3	0	0	0	0	**46**
7	Nov-00	*Sphyraenidae*	1	0	1	0	0	0	0	**2**
7	Nov-00	*Tetraodontidae*	0	0	1	0	0	0	0	**1**
7	Dec-00	*Acanthuridae*	0	0	1	0	0	0	0	**1**
7	Dec-00	*Gerreidae*	0	16	16	0	0	0	0	**32**
7	Dec-00	*Haemulidae*	5	9	27	13	0	0	0	**54**
7	Dec-00	*Labridae*	1	6	0	0	0	0	0	**7**
7	Dec-00	*Lutjanidae*	1	2	35	24	4	0	0	**66**
7	Dec-00	*Mullidae*	0	0	7	8	0	0	0	**15**
7	Dec-00	*Pomacentridae*	2	6	0	0	0	0	0	**8**
7	Dec-00	*Scaridae*	43	20	12	0	0	0	0	**75**
7	Jan-01	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
7	Jan-01	*Gerreidae*	0	4	5	0	0	0	0	**9**
7	Jan-01	*Haemulidae*	1	23	37	3	0	0	0	**64**
7	Jan-01	*Labridae*	3	2	0	0	0	0	0	**5**
7	Jan-01	*Lutjanidae*	0	1	4	44	2	0	0	**51**
7	Jan-01	*Mullidae*	0	0	4	7	0	0	0	**11**
7	Jan-01	*Pomacentridae*	2	4	0	0	0	0	0	**6**
7	Jan-01	*Scaridae*	17	15	7	0	0	0	0	**39**
7	Jan-01	*Sphyraenidae*	0	0	0	1	2	0	1	**4**
7	Feb-01	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
7	Feb-01	*Haemulidae*	2	0	23	5	0	0	0	**30**
7	Feb-01	*Labridae*	0	4	0	0	0	0	0	**4**
7	Feb-01	*Lutjanidae*	0	3	12	16	0	0	0	**31**
7	Feb-01	*Mullidae*	0	0	0	7	0	0	0	**7**
7	Feb-01	*Pomacentridae*	5	10	0	0	0	0	0	**15**
7	Feb-01	*Scaridae*	15	7	1	0	0	0	0	**23**
7	Feb-01	*Sphyraenidae*	0	0	0	1	0	0	0	**1**
7	Mar-01	*Gerreidae*	0	0	7	0	0	0	0	**7**
7	Mar-01	*Haemulidae*	2	0	12	8	0	0	0	**22**
7	Mar-01	*Lutjanidae*	0	3	8	27	0	0	0	**38**
7	Mar-01	*Mullidae*	0	0	0	0	5	0	0	**5**
7	Mar-01	*Pomacentridae*	4	3	0	0	0	0	0	**7**
7	Mar-01	*Scaridae*	22	0	0	0	0	0	0	**22**

7	Mar-01	*Scaridae*	0	3	4	0	0	0	0	7
7	Mar-01	*Sphyraenidae*	0	0	0	0	1	1	1	3
8	Jun-99	*Acanthuridae*	0	0	1	0	0	0	0	1
8	Jun-99	*Chaetodontidae*	1	2	0	0	0	0	0	3
8	Jun-99	*Gerreidae*	5	3	0	0	0	0	0	8
8	Jun-99	*Haemulidae*	0	23	10	2	0	0	0	35
8	Jun-99	*Labridae*	1	2	0	0	0	0	0	3
8	Jun-99	*Lutjanidae*	1	3	10	13	10	0	0	37
8	Jun-99	*Pomacentridae*	4	7	0	0	0	0	0	11
8	Jun-99	*Scaridae*	66	0	0	0	0	0	0	66
8	Jun-99	*Sphyraenidae*	0	0	1	0	0	0	0	1
8	Jul-99	*Acanthuridae*	0	0	2	0	0	0	0	2
8	Jul-99	*Gerreidae*	0	4	1	0	0	0	0	5
8	Jul-99	*Gobiidae*	3	0	0	0	0	0	0	3
8	Jul-99	*Haemulidae*	0	11	24	0	0	0	0	35
8	Jul-99	*Labridae*	0	2	0	0	0	0	0	2
8	Jul-99	*Lutjanidae*	0	2	4	16	20	0	0	42
8	Jul-99	*Pomacentridae*	3	6	0	0	0	0	0	9
8	Jul-99	*Scaridae*	89	1	3	4	0	0	0	97
8	Jul-99	*Sphyraenidae*	0	3	2	0	0	0	0	5
8	Aug-99	*Acanthuridae*	0	0	1	0	0	0	0	1
8	Aug-99	*Gerreidae*	10	3	22	0	1	0	0	36
8	Aug-99	*Haemulidae*	0	13	36	0	3	0	0	52
8	Aug-99	*Labridae*	0	3	0	0	0	0	0	3
8	Aug-99	*Lutjanidae*	0	4	17	11	5	0	0	37
8	Aug-99	*Pomacentridae*	5	4	0	0	0	0	0	9
8	Aug-99	*Scaridae*	8	1	0	2	0	0	0	11
8	Aug-99	*Sphyraenidae*	0	0	1	0	0	1	2	4
8	Oct-99	*Chaetodontidae*	5	0	0	0	0	0	0	5
8	Oct-99	*Gerreidae*	0	86	0	0	0	0	0	86
8	Oct-99	*Haemulidae*	42	16	0	0	0	0	0	58
8	Oct-99	*Labridae*	1	1	0	0	0	0	0	2
8	Oct-99	*Lutjanidae*	5	16	25	13	3	0	0	62
8	Oct-99	*Ostraciidae*	0	0	1	0	0	0	0	1
8	Oct-99	*Pomacentridae*	6	6	0	0	0	0	0	12
8	Oct-99	*Scaridae*	18	1	0	0	0	0	0	19
8	Oct-99	*Sphyraenidae*	0	0	0	1	0	1	1	3
8	Nov-99	*Carangidae*	0	0	2	0	0	0	0	2
8	Nov-99	*Chaetodontidae*	3	0	0	0	0	0	0	3
8	Nov-99	*Gerreidae*	0	9	4	1	0	0	0	14
8	Nov-99	*Haemulidae*	0	12	13	0	0	0	0	25
8	Nov-99	*Labridae*	1	1	0	0	0	0	0	2
8	Nov-99	*Lutjanidae*	3	21	41	13	0	0	0	78
8	Nov-99	*Mullidae*	0	1	1	0	0	0	0	2
8	Nov-99	*Pomacentridae*	2	5	0	0	0	0	0	7
8	Nov-99	*Scaridae*	11	6	2	0	0	0	0	19
8	Dec-99	*Chaetodontidae*	1	0	0	0	0	0	0	1
8	Dec-99	*Haemulidae*	54	30	9	0	1	0	0	94
8	Dec-99	*Labridae*	1	1	0	0	0	0	0	2
8	Dec-99	*Lutjanidae*	1	9	15	41	1	0	0	67
8	Dec-99	*Mullidae*	0	0	2	0	0	0	0	2
8	Dec-99	*Pomacentridae*	5	5	0	0	0	0	0	10
8	Dec-99	*Scaridae*	1	2	0	0	0	0	0	3
8	Dec-99	*Sphyraenidae*	0	1	1	1	0	1	1	5
8	Jan-00	*Chaetodontidae*	0	1	0	0	0	0	0	1
8	Jan-00	*Gerreidae*	3	5	0	0	0	0	0	8
8	Jan-00	*Haemulidae*	24	3	0	0	0	0	0	27
8	Jan-00	*Labridae*	0	3	0	0	0	0	0	3
8	Jan-00	*Lutjanidae*	3	4	18	35	2	0	0	62
8	Jan-00	*Pomacentridae*	3	2	0	0	0	0	0	5
8	Jan-00	*Sphyraenidae*	0	0	0	1	0	0	0	1
8	Feb-00	*Chaetodontidae*	2	0	0	0	0	0	0	2
8	Feb-00	*Gerreidae*	0	3	3	0	0	0	0	6
8	Feb-00	*Haemulidae*	0	35	5	6	3	0	0	49
8	Feb-00	*Labridae*	0	4	0	0	0	0	0	4
8	Feb-00	*Lutjanidae*	0	3	3	32	11	0	0	49
8	Feb-00	*Mullidae*	1	0	1	0	0	0	0	2
8	Feb-00	*Pomacanthidae*	0	0	1	1	0	0	0	2
8	Feb-00	*Pomacentridae*	1	9	0	0	0	0	0	10
8	Feb-00	*Scaridae*	0	0	6	1	0	0	0	7
8	Mar-00	*Chaetodontidae*	2	0	0	0	0	0	0	2
8	Mar-00	*Gerreidae*	0	88	7	0	0	0	0	95
8	Mar-00	*Haemulidae*	0	48	10	2	0	0	0	60
8	Mar-00	*Labridae*	0	4	0	0	0	0	0	4

8	Mar-00	*Lutjanidae*	2	1	9	31	6	0	0	**49**
8	Mar-00	*Mullidae*	0	0	1	0	0	0	0	**1**
8	Mar-00	*Pomacanthidae*	2	7	1	0	0	0	0	**10**
8	Mar-00	*Scaridae*	0	1	4	0	0	0	0	**5**
8	Mar-00	*Sphyraenidae*	0	0	0	1	0	0	0	**1**
8	Apr-00	*Chaetodontidae*	2	0	0	0	0	0	0	**2**
8	Apr-00	*Gerreidae*	7	47	0	0	0	0	0	**54**
8	Apr-00	*Haemulidae*	17	42	13	0	0	0	0	**72**
8	Apr-00	*Labridae*	0	3	0	0	0	0	0	**3**
8	Apr-00	*Lutjanidae*	4	3	49	7	0	0	0	**63**
8	Apr-00	*Pomacanthidae*	0	0	1	0	0	0	0	**1**
8	Apr-00	*Pomacentridae*	5	3	0	0	0	0	0	**8**
8	Apr-00	*Scaridae*	1	2	0	0	0	0	0	**3**
8	Apr-00	*Sphyraenidae*	0	0	1	2	0	0	0	**3**
8	May-00	*Chaetodontidae*	2	0	0	0	0	0	0	**2**
8	May-00	*Gerreidae*	7	22	0	0	0	0	0	**29**
8	May-00	*Haemulidae*	5	44	19	3	0	0	0	**71**
8	May-00	*Labridae*	2	1	0	0	0	0	0	**3**
8	May-00	*Lutjanidae*	4	5	18	5	1	0	0	**33**
8	May-00	*Pomacanthidae*	0	0	1	0	0	0	0	**1**
8	May-00	*Pomacentridae*	2	4	0	0	0	0	0	**6**
8	May-00	*Scaridae*	0	0	1	0	0	0	0	**1**
8	May-00	*Sphyraenidae*	1	0	0	0	0	0	0	**1**
8	Jun-00	*Chaetodontidae*	5	0	0	0	0	0	0	**5**
8	Jun-00	*Gerreidae*	6	38	3	0	0	0	0	**47**
8	Jun-00	*Haemulidae*	25	56	1	0	0	0	0	**82**
8	Jun-00	*Labridae*	6	3	0	0	0	0	0	**9**
8	Jun-00	*Lutjanidae*	2	14	20	11	0	0	0	**47**
8	Jun-00	*Pomacanthidae*	0	0	1	0	0	0	0	**1**
8	Jun-00	*Pomacentridae*	6	2	0	0	0	0	0	**8**
8	Jun-00	*Scaridae*	18	2	1	0	0	0	0	**21**
8	Jun-00	*Sphyraenidae*	2	1	0	0	0	0	0	**3**
8	Jul-00	*Carangidae*	3	0	0	0	0	0	0	**3**
8	Jul-00	*Gerreidae*	15	78	2	0	0	0	0	**95**
8	Jul-00	*Haemulidae*	16	41	16	2	0	0	0	**75**
8	Jul-00	*Labridae*	1	3	0	0	0	0	0	**4**
8	Jul-00	*Lutjanidae*	0	18	41	12	5	0	0	**76**
8	Jul-00	*Mullidae*	0	0	1	0	0	0	0	**1**
8	Jul-00	*Pomacentridae*	6	10	0	0	0	0	0	**16**
8	Jul-00	*Scaridae*	21	2	0	0	0	0	0	**23**
8	Jul-00	*Sphyraenidae*	0	1	0	1	1	0	1	**4**
8	Aug-00	*Carangidae*	0	0	0	0	6	0	0	**6**
8	Aug-00	*Gerreidae*	0	0	12	1	0	0	0	**13**
8	Aug-00	*Haemulidae*	31	35	36	1	0	0	0	**103**
8	Aug-00	*Labridae*	0	2	0	0	0	0	0	**2**
8	Aug-00	*Lutjanidae*	0	4	36	19	0	0	0	**59**
8	Aug-00	*Mullidae*	0	0	2	0	0	0	0	**2**
8	Aug-00	*Pomacentridae*	6	6	0	0	0	0	0	**12**
8	Aug-00	*Scaridae*	10	0	0	0	0	0	0	**10**
8	Aug-00	*Sparidae*	0	1	0	0	0	0	0	**1**
8	Oct-00	*Acanthuridae*	1	0	0	0	0	0	0	**1**
8	Oct-00	*Carangidae*	0	0	0	9	0	0	0	**9**
8	Oct-00	*Chaetodontidae*	3	0	0	0	0	0	0	**3**
8	Oct-00	*Gerreidae*	0	0	4	0	0	0	0	**4**
8	Oct-00	*Haemulidae*	27	36	29	12	0	0	0	**104**
8	Oct-00	*Labridae*	0	1	0	0	0	0	0	**1**
8	Oct-00	*Lutjanidae*	1	4	80	10	0	0	0	**95**
8	Oct-00	*Mullidae*	0	1	9	1	0	0	0	**11**
8	Oct-00	*Pomacanthidae*	0	0	0	1	0	0	0	**1**
8	Oct-00	*Pomacentridae*	6	3	0	0	0	0	0	**9**
8	Oct-00	*Scaridae*	6	4	2	0	0	0	0	**12**
8	Oct-00	*Sphyraenidae*	0	0	1	1	0	1	0	**3**
8	Nov-00	*Chaetodontidae*	1	1	0	0	0	0	0	**2**
8	Nov-00	*Gerreidae*	1	69	1	0	0	0	0	**71**
8	Nov-00	*Haemulidae*	0	74	37	4	0	0	0	**115**
8	Nov-00	*Labridae*	16	3	0	0	0	0	0	**19**
8	Nov-00	*Lutjanidae*	3	3	48	14	5	0	0	**73**
8	Nov-00	*Pomacentridae*	6	7	0	0	0	0	0	**13**
8	Nov-00	*Scaridae*	27	1	0	0	0	0	0	**28**
8	Nov-00	*Sphyraenidae*	0	1	1	0	0	0	0	**2**
8	Dec-00	*Acanthuridae*	1	0	0	0	0	0	0	**1**
8	Dec-00	*Carangidae*	0	0	0	1	0	0	0	**1**
8	Dec-00	*Chaetodontidae*	2	0	0	0	0	0	0	**2**
8	Dec-00	*Gerreidae*	0	15	7	0	0	0	0	**22**

8	Dec-00	*Haemulidae*	17	52	23	0	0	0	0	**92**
8	Dec-00	*Labridae*	2	0	0	0	0	0	0	**2**
8	Dec-00	*Lutjanidae*	0	8	23	46	7	0	0	**84**
8	Dec-00	*Mullidae*	0	0	2	0	0	0	0	**2**
8	Dec-00	*Pomacentridae*	5	7	0	0	0	0	0	**12**
8	Dec-00	*Scaridae*	2	0	0	0	0	0	0	**2**
8	Dec-00	*Serranidae*	0	1	0	0	1	0	0	**2**
8	Dec-00	*Sphyraenidae*	0	0	1	0	1	0	0	**2**
8	Jan-01	*Carangidae*	0	0	0	1	0	0	0	**1**
8	Jan-01	*Gerreidae*	0	46	27	0	0	0	0	**73**
8	Jan-01	*Haemulidae*	0	39	27	0	0	0	0	**66**
8	Jan-01	*Labridae*	2	0	0	0	0	0	0	**2**
8	Jan-01	*Lutjanidae*	0	6	17	45	13	0	0	**81**
8	Jan-01	*Pomacentridae*	1	3	0	0	0	0	0	**4**
8	Jan-01	*Scaridae*	5	0	0	0	0	0	0	**5**
8	Jan-01	*Sphyraenidae*	0	0	1	0	0	0	0	**1**
8	Jan-01	*Tetraodontidae*	0	0	0	1	0	0	0	**1**
8	Feb-01	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
8	Feb-01	*Gerreidae*	0	7	0	0	0	0	0	**7**
8	Feb-01	*Haemulidae*	0	43	23	6	0	0	0	**72**
8	Feb-01	*Labridae*	0	1	0	0	0	0	0	**1**
8	Feb-01	*Lutjanidae*	0	1	1	45	13	0	0	**60**
8	Feb-01	*Mullidae*	0	0	0	1	0	0	0	**1**
8	Feb-01	*Pomacentridae*	3	3	0	0	0	0	0	**6**
8	Feb-01	*Scaridae*	0	0	4	0	0	0	0	**4**
8	Feb-01	*Sphyraenidae*	0	0	0	2	0	0	1	**3**
8	Mar-01	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
8	Mar-01	*Haemulidae*	0	25	32	9	0	0	0	**66**
8	Mar-01	*Labridae*	0	2	0	0	0	0	0	**2**
8	Mar-01	*Lutjanidae*	0	0	12	43	8	0	0	**63**
8	Mar-01	*Mullidae*	0	0	2	0	0	0	0	**2**
8	Mar-01	*Pomacentridae*	4	4	0	0	0	0	0	**8**
8	Mar-01	*Scaridae*	0	2	7	0	0	0	0	**9**
8	Mar-01	*Serranidae*	0	0	0	0	1	0	0	**1**
9	Jun-99	*Gerreidae*	6	0	0	0	0	0	0	**6**
9	Jun-99	*Gobiidae*	2	1	0	0	0	0	0	**3**
9	Jun-99	*Haemulidae*	10	10	1	0	0	0	0	**21**
9	Jun-99	*Lutjanidae*	1	1	2	0	0	0	0	**4**
9	Jun-99	*Scaridae*	49	1	3	0	0	0	0	**53**
9	Jun-99	*Sphyraenidae*	0	0	0	1	0	0	0	**1**
9	Jun-99	*Tetraodontidae*	0	0	0	1	0	0	0	**1**
9	Jul-99	*Chaetodontidae*	0	3	0	0	0	0	0	**3**
9	Jul-99	*Gerreidae*	2	2	2	0	0	0	0	**6**
9	Jul-99	*Haemulidae*	4	9	1	0	0	0	0	**14**
9	Jul-99	*Lutjanidae*	0	1	3	0	0	0	0	**4**
9	Jul-99	*Scaridae*	93	0	2	0	0	0	0	**95**
9	Jul-99	*Sphyraenidae*	0	0	2	2	1	0	0	**5**
9	Aug-99	*Carcharhinidae*	0	0	0	0	0	0	1	**1**
9	Aug-99	*Gerreidae*	0	4	1	0	0	0	0	**5**
9	Aug-99	*Lutjanidae*	0	0	0	2	0	0	0	**2**
9	Aug-99	*Scaridae*	3	0	0	0	0	0	0	**3**
9	Aug-99	*Sphyraenidae*	0	0	0	2	0	0	0	**2**
9	Oct-99	*Carangidae*	0	0	1	0	0	0	0	**1**
9	Oct-99	*Gerreidae*	0	1	0	0	0	0	0	**1**
9	Oct-99	*Haemulidae*	0	0	2	0	0	0	0	**2**
9	Oct-99	*Lutjanidae*	0	1	4	2	0	0	0	**7**
9	Oct-99	*Scaridae*	0	0	1	0	0	0	0	**1**
9	Oct-99	*Sphyraenidae*	0	0	0	0	1	0	0	**1**
9	Nov-99	*Carangidae*	0	0	1	0	0	0	0	**1**
9	Nov-99	*Chaetodontidae*	1	2	0	0	0	0	0	**3**
9	Nov-99	*Gerreidae*	0	0	1	0	0	0	0	**1**
9	Nov-99	*Gobiidae*	2	1	0	0	0	0	0	**3**
9	Nov-99	*Labridae*	1	0	0	0	0	0	0	**1**
9	Nov-99	*Lutjanidae*	1	3	3	2	0	0	0	**9**
9	Nov-99	*Scaridae*	13	0	0	0	0	0	0	**13**
9	Nov-99	*Sphyraenidae*	0	1	0	1	0	0	0	**2**
9	Dec-99	*Gerreidae*	0	2	1	0	0	0	0	**3**
9	Dec-99	*Haemulidae*	1	0	0	0	0	0	0	**1**
9	Dec-99	*Lutjanidae*	0	0	1	0	0	0	0	**1**
9	Dec-99	*Pomacentridae*	1	0	0	0	0	0	0	**1**
9	Dec-99	*Scaridae*	20	0	0	0	0	0	0	**20**
9	Dec-99	*Sphyraenidae*	0	0	0	0	1	1	0	**2**
9	Jan-00	*Gobiidae*	10	0	0	0	0	0	0	**10**
9	Jan-00	*Haemulidae*	14	0	0	0	0	0	0	**14**

9	Jan-00	*Labridae*	0	2	0	0	0	0	0	**2**
9	Jan-00	*Lutjanidae*	1	0	0	0	0	0	0	**1**
9	Jan-00	*Scaridae*	26	3	0	0	0	0	0	**29**
9	Feb-00	*Gerreidae*	7	0	0	0	0	0	0	**7**
9	Feb-00	*Gobiidae*	3	0	0	0	0	0	0	**3**
9	Feb-00	*Haemulidae*	8	0	0	0	0	0	0	**8**
9	Feb-00	*Scaridae*	9	0	0	0	0	0	0	**9**
9	Mar-00	*Gerreidae*	8	2	2	0	0	0	0	**12**
9	Mar-00	*Gobiidae*	8	0	0	0	0	0	0	**8**
9	Mar-00	*Haemulidae*	18	4	0	0	0	0	0	**22**
9	Mar-00	*Lutjanidae*	0	1	0	0	0	0	0	**1**
9	Mar-00	*Scaridae*	23	7	0	0	0	0	0	**30**
9	Mar-00	*Sphyraenidae*	0	0	0	1	0	0	0	**1**
9	Apr-00	*Chaetodontidae*	3	0	0	0	0	0	0	**3**
9	Apr-00	*Gerreidae*	6	2	0	0	0	0	0	**8**
9	Apr-00	*Gobiidae*	4	0	0	0	0	0	0	**4**
9	Apr-00	*Haemulidae*	15	0	0	0	0	0	0	**15**
9	Apr-00	*Labridae*	2	0	0	0	0	0	0	**2**
9	Apr-00	*Lutjanidae*	3	4	1	0	0	0	0	**8**
9	Apr-00	*Pomacentridae*	0	2	0	0	0	0	0	**2**
9	Apr-00	*Scaridae*	30	3	1	0	0	0	0	**34**
9	Apr-00	*Sphyraenidae*	1	0	0	0	1	0	0	**2**
9	May-00	*Gerreidae*	4	2	1	0	0	0	0	**7**
9	May-00	*Gobiidae*	2	0	0	0	0	0	0	**2**
9	May-00	*Haemulidae*	9	2	0	0	0	0	0	**11**
9	May-00	*Lutjanidae*	0	1	4	1	0	0	0	**6**
9	May-00	*Pomacentridae*	1	0	0	0	0	0	0	**1**
9	May-00	*Scaridae*	3	1	0	0	0	0	0	**4**
9	Jun-00	*Gerreidae*	16	8	0	0	0	0	0	**24**
9	Jun-00	*Haemulidae*	11	1	0	0	0	0	0	**12**
9	Jun-00	*Lutjanidae*	0	2	2	0	0	0	0	**4**
9	Jun-00	*Sphyraenidae*	0	1	0	0	0	0	0	**1**
9	Jun-00	*Tetraodontidae*	0	0	0	1	0	0	0	**1**
9	Jul-00	*Gerreidae*	55	16	0	0	0	0	0	**71**
9	Jul-00	*Haemulidae*	3	0	3	0	0	0	0	**6**
9	Jul-00	*Lutjanidae*	0	4	2	2	1	0	0	**9**
9	Jul-00	*Scaridae*	20	0	0	0	0	0	0	**20**
9	Aug-00	*Gerreidae*	0	10	11	0	0	0	0	**21**
9	Aug-00	*Haemulidae*	0	0	9	0	0	0	0	**9**
9	Aug-00	*Lutjanidae*	0	1	5	1	0	0	0	**7**
9	Aug-00	*Scaridae*	7	0	0	0	0	0	0	**7**
9	Aug-00	*Sphyraenidae*	0	0	1	0	0	0	0	**1**
9	Oct-00	*Carangidae*	0	0	6	0	0	0	0	**6**
9	Oct-00	*Gerreidae*	0	2	0	0	0	0	0	**2**
9	Oct-00	*Haemulidae*	1	0	2	0	0	0	0	**3**
9	Oct-00	*Lutjanidae*	0	0	3	1	0	0	0	**4**
9	Oct-00	*Pomacentridae*	1	0	0	0	0	0	0	**1**
9	Oct-00	*Scaridae*	4	6	0	0	0	0	0	**10**
9	Nov-00	*Gerreidae*	0	9	0	0	0	0	0	**9**
9	Nov-00	*Tetraodontidae*	0	0	0	0	1	0	0	**1**
9	Dec-00	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
9	Dec-00	*Gerreidae*	0	1	1	0	0	0	0	**2**
9	Dec-00	*Gobiidae*	4	0	0	0	0	0	0	**4**
9	Dec-00	*Haemulidae*	7	2	0	0	0	0	0	**9**
9	Dec-00	*Lutjanidae*	1	2	0	6	2	0	0	**11**
9	Dec-00	*Pomacentridae*	1	1	0	0	0	0	0	**2**
9	Dec-00	*Scaridae*	24	14	0	0	0	0	0	**38**
9	Jan-01	*Gerreidae*	0	2	0	0	0	0	0	**2**
9	Jan-01	*Scaridae*	8	0	0	0	0	0	0	**8**
9	Jan-01	*Tetraodontidae*	0	0	0	2	0	0	0	**2**
9	Feb-01	*Gobiidae*	2	0	0	0	0	0	0	**2**
9	Feb-01	*Haemulidae*	7	2	0	0	0	0	0	**9**
9	Feb-01	*Lutjanidae*	1	0	0	2	0	0	0	**3**
9	Feb-01	*Scaridae*	12	1	0	0	0	0	0	**13**
9	Mar-01	*Acanthuridae*	0	1	0	0	0	0	0	**1**
9	Mar-01	*Chaetodontidae*	0	1	0	0	0	0	0	**1**
9	Mar-01	*Gerreidae*	0	0	2	0	0	0	0	**2**
9	Mar-01	*Gobiidae*	3	0	0	0	0	0	0	**3**
9	Mar-01	*Haemulidae*	24	0	2	0	0	0	0	**26**
9	Mar-01	*Lutjanidae*	0	0	1	1	5	2	0	**9**
9	Mar-01	*Scaridae*	15	5	1	0	0	0	0	**21**
9	Mar-01	*Sphyraenidae*	0	0	0	0	0	0	1	**1**
10	Jun-99	*Belonidae*	0	0	2	2	0	0	0	**4**
10	Jun-99	*Gerreidae*	46	15	2	0	0	0	0	**63**

10	Jun-99	*Haemulidae*	0	5	0	0	0	0	0	**5**
10	Jun-99	*Lutjanidae*	0	1	0	0	0	0	0	**1**
10	Jun-99	*Sphyraenidae*	0	0	1	1	0	0	0	**2**
10	Jul-99	*Gerreidae*	59	13	0	0	0	0	0	**72**
10	Jul-99	*Haemulidae*	0	2	0	0	0	0	0	**2**
10	Jul-99	*Lutjanidae*	1	2	0	0	0	0	0	**3**
10	Jul-99	*Sphyraenidae*	0	0	1	0	0	0	0	**1**
10	Aug-99	*Gerreidae*	3	26	2	0	0	0	0	**31**
10	Aug-99	*Haemulidae*	7	10	0	0	0	0	0	**17**
10	Aug-99	*Lutjanidae*	4	5	0	0	0	0	0	**9**
10	Aug-99	*Scaridae*	3	0	0	0	0	0	0	**3**
10	Aug-99	*Sphyraenidae*	0	0	1	0	0	0	0	**1**
10	Oct-99	*Gerreidae*	11	38	4	0	0	0	0	**53**
10	Oct-99	*Lutjanidae*	6	0	0	0	0	0	0	**6**
10	Oct-99	*Sphyraenidae*	0	0	1	0	0	2	0	**3**
10	Nov-99	*Belonidae*	0	3	0	2	0	0	0	**5**
10	Nov-99	*Gerreidae*	29	3	0	2	0	0	0	**34**
10	Nov-99	*Lutjanidae*	1	0	0	0	0	0	0	**1**
10	Dec-99	*Belonidae*	0	0	0	12	0	0	0	**12**
10	Dec-99	*Gerreidae*	11	0	0	0	0	0	0	**11**
10	Dec-99	*Lutjanidae*	2	0	0	0	0	0	0	**2**
10	Dec-99	*Scaridae*	1	0	0	0	0	0	0	**1**
10	Dec-99	*Sphyraenidae*	1	0	0	0	0	0	0	**1**
10	Feb-00	*Gerreidae*	9	0	1	0	0	0	0	**10**
10	Feb-00	*Gobiidae*	6	0	0	0	0	0	0	**6**
10	Feb-00	*Lutjanidae*	0	1	0	0	0	0	0	**1**
10	Mar-00	*Gerreidae*	8	1	0	0	0	0	0	**9**
10	Mar-00	*Lutjanidae*	0	1	0	0	0	0	0	**1**
10	Apr-00	*Belonidae*	0	0	0	1	0	0	0	**1**
10	Apr-00	*Gerreidae*	1	5	0	1	0	0	0	**7**
10	Apr-00	*Lutjanidae*	2	4	0	0	0	0	0	**6**
10	Apr-00	*Sphyraenidae*	0	0	0	0	1	0	0	**1**
10	May-00	*Gerreidae*	19	1	0	0	0	0	0	**20**
10	May-00	*Lutjanidae*	1	0	0	0	0	0	0	**1**
10	Jun-00	*Gerreidae*	67	0	0	0	0	0	0	**67**
10	Jul-00	*Gerreidae*	36	0	0	0	0	0	0	**36**
10	Jul-00	*Sphyraenidae*	0	0	1	0	0	0	0	**1**
10	Aug-00	*Belonidae*	0	0	1	7	0	0	0	**8**
10	Aug-00	*Gerreidae*	101	3	0	0	0	0	0	**104**
10	Aug-00	*Lutjanidae*	0	1	0	0	0	0	0	**1**
10	Aug-00	*Sphyraenidae*	1	0	0	0	0	0	0	**1**
10	Oct-00	*Gerreidae*	22	0	1	0	0	0	0	**23**
10	Oct-00	*Lutjanidae*	3	0	0	0	0	0	0	**3**
10	Dec-00	*Gerreidae*	13	1	0	0	0	0	0	**14**
10	Dec-00	*Lutjanidae*	0	4	0	0	0	0	0	**4**
10	Jan-01	*Gerreidae*	0	12	0	0	0	0	0	**12**
10	Feb-01	*Gerreidae*	2	0	0	0	0	0	0	**2**
10	Mar-01	*Belonidae*	0	0	0	0	7	0	0	**7**
10	Mar-01	*Gerreidae*	0	9	0	0	0	0	0	**9**
10	Mar-01	*Haemulidae*	0	2	0	0	0	0	0	**2**
10	Mar-01	*Lutjanidae*	0	0	1	0	0	0	0	**1**
11	Jun-99	*Gerreidae*	20	6	0	0	0	0	0	**26**
11	Jun-99	*Lutjanidae*	4	1	1	0	0	0	0	**6**
11	Jun-99	*Pomacentridae*	0	2	0	0	0	0	0	**2**
11	Jun-99	*Sphyraenidae*	0	2	0	0	0	0	0	**2**
11	Jul-99	*Albulidae*	0	0	0	0	0	0	1	**1**
11	Jul-99	*Gerreidae*	38	7	0	0	0	0	0	**45**
11	Jul-99	*Lutjanidae*	5	4	0	0	0	0	0	**9**
11	Jul-99	*Sphyraenidae*	0	0	1	0	0	0	0	**1**
11	Aug-99	*Belonidae*	0	0	0	1	0	0	0	**1**
11	Aug-99	*Gerreidae*	0	3	0	0	0	0	0	**3**
11	Oct-99	*Belonidae*	0	0	0	0	2	0	0	**2**
11	Oct-99	*Gerreidae*	33	58	1	1	0	0	0	**93**
11	Oct-99	*Haemulidae*	4	0	0	0	0	0	0	**4**
11	Oct-99	*Lutjanidae*	1	2	0	1	0	0	0	**4**
11	Oct-99	*Pomacentridae*	2	0	0	0	0	0	0	**2**
11	Oct-99	*Sphyraenidae*	0	0	0	1	1	0	0	**2**
11	Nov-99	*Gerreidae*	3	4	0	0	0	0	0	**7**
11	Nov-99	*Lutjanidae*	3	1	0	0	0	0	0	**4**
11	Dec-99	*Gerreidae*	5	6	0	0	0	0	0	**11**
11	Dec-99	*Lutjanidae*	3	0	0	0	0	0	0	**3**
11	Dec-99	*Sphyraenidae*	0	0	0	2	0	0	0	**2**
11	Jan-00	*Albulidae*	0	0	0	0	0	0	1	**1**
11	Jan-00	*Gerreidae*	1	1	0	0	0	0	0	**2**

11	Jan-00	*Sphyraenidae*	0	0	0	0	1	0	0	**1**
11	Feb-00	*Gerreidae*	11	9	3	0	0	0	0	**23**
11	Mar-00	*Gerreidae*	13	8	0	0	0	0	0	**21**
11	Mar-00	*Lutjanidae*	3	0	0	0	0	0	0	**3**
11	Apr-00	*Gerreidae*	15	6	0	0	0	0	0	**21**
11	Apr-00	*Lutjanidae*	2	0	0	0	0	0	0	**2**
11	May-00	*Gerreidae*	23	4	0	0	0	0	0	**27**
11	May-00	*Lutjanidae*	1	0	0	0	0	0	0	**1**
11	May-00	*Sphyraenidae*	0	1	0	0	0	0	0	**1**
11	Jun-00	*Belonidae*	0	0	1	0	0	0	0	**1**
11	Jun-00	*Gerreidae*	24	5	0	0	0	0	0	**29**
11	Jun-00	*Haemulidae*	2	0	0	0	0	0	0	**2**
11	Jun-00	*Lutjanidae*	1	0	0	0	0	0	0	**1**
11	Jun-00	*Sphyraenidae*	0	1	0	0	0	0	0	**1**
11	Jul-00	*Gerreidae*	12	1	0	0	0	0	0	**13**
11	Jul-00	*Sphyraenidae*	0	1	0	0	0	0	0	**1**
11	Aug-00	*Gerreidae*	3	9	0	0	0	0	0	**12**
11	Aug-00	*Sphyraenidae*	1	0	1	0	0	0	0	**2**
11	Oct-00	*Belonidae*	0	2	0	0	0	0	0	**2**
11	Oct-00	*Gerreidae*	15	1	3	0	0	0	0	**19**
11	Oct-00	*Lutjanidae*	3	0	2	0	0	0	0	**5**
11	Oct-00	*Sphyraenidae*	0	2	2	1	0	0	0	**5**
11	Nov-00	*Gerreidae*	1	0	0	0	0	0	0	**1**
11	Dec-00	*Gerreidae*	21	0	0	0	0	0	0	**21**
11	Dec-00	*Lutjanidae*	1	0	0	0	0	0	0	**1**
11	Jan-01	*Gerreidae*	26	15	0	0	0	0	0	**41**
11	Jan-01	*Lutjanidae*	2	0	0	0	0	0	0	**2**
11	Jan-01	*Sphyraenidae*	1	0	0	2	0	0	0	**3**
11	Feb-01	*Gerreidae*	0	13	0	0	0	0	0	**13**
11	Feb-01	*Lutjanidae*	1	0	0	0	0	0	0	**1**
11	Feb-01	*Scaridae*	2	0	0	0	0	0	0	**2**
11	Feb-01	*Sphyraenidae*	0	0	0	1	0	0	0	**1**
11	Mar-01	*Gerreidae*	9	0	1	0	0	0	0	**10**
11	Mar-01	*Sphyraenidae*	0	1	0	0	1	0	0	**2**
12	Jun-99	*Chaetodontidae*	0	4	0	0	0	0	0	**4**
12	Jun-99	*Gerreidae*	21	0	0	0	0	0	0	**21**
12	Jun-99	*Haemulidae*	2	14	4	1	0	0	0	**21**
12	Jun-99	*Lutjanidae*	0	0	1	5	3	0	0	**9**
12	Jun-99	*Scaridae*	0	17	0	0	0	0	0	**17**
12	Jun-99	*Sphyraenidae*	0	1	0	0	0	0	0	**1**
12	Jul-99	*Chaetodontidae*	0	4	0	0	0	0	0	**4**
12	Jul-99	*Gerreidae*	3	4	1	0	0	0	0	**8**
12	Jul-99	*Haemulidae*	6	39	7	0	0	0	0	**52**
12	Jul-99	*Lutjanidae*	0	5	3	0	8	2	0	**18**
12	Jul-99	*Scaridae*	0	5	4	1	0	0	0	**10**
12	Aug-99	*Chaetodontidae*	0	2	0	0	0	0	0	**2**
12	Aug-99	*Gerreidae*	14	1	0	1	0	0	0	**16**
12	Aug-99	*Haemulidae*	3	11	0	0	0	0	0	**14**
12	Aug-99	*Lutjanidae*	0	0	0	0	9	0	0	**9**
12	Aug-99	*Pomacanthidae*	0	0	0	1	0	0	0	**1**
12	Aug-99	*Scaridae*	13	0	0	0	0	0	0	**13**
12	Aug-99	*Sphyraenidae*	0	0	0	2	0	0	0	**2**
12	Oct-99	*Gerreidae*	0	7	0	0	0	0	0	**7**
12	Oct-99	*Haemulidae*	9	5	0	0	0	0	0	**14**
12	Oct-99	*Lutjanidae*	2	9	4	1	1	0	0	**17**
12	Oct-99	*Sphyraenidae*	0	1	0	1	1	1	0	**4**
12	Nov-99	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
12	Nov-99	*Gerreidae*	1	0	0	0	0	0	0	**1**
12	Nov-99	*Haemulidae*	25	1	0	0	0	0	0	**26**
12	Nov-99	*Lutjanidae*	2	6	2	4	3	0	0	**17**
12	Dec-99	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
12	Dec-99	*Gerreidae*	0	1	4	0	0	0	0	**5**
12	Dec-99	*Haemulidae*	4	7	28	0	0	0	0	**39**
12	Dec-99	*Lutjanidae*	0	1	3	0	2	0	0	**6**
12	Dec-99	*Scaridae*	0	1	2	0	0	0	0	**3**
12	Jan-00	*Gerreidae*	0	13	0	0	0	0	0	**13**
12	Jan-00	*Haemulidae*	0	5	15	0	0	0	0	**20**
12	Jan-00	*Lutjanidae*	0	1	0	0	0	0	0	**1**
12	Jan-00	*Sphyraenidae*	0	1	0	0	0	0	0	**1**
12	Feb-00	*Gerreidae*	0	2	1	0	0	0	0	**3**
12	Feb-00	*Haemulidae*	0	0	11	11	0	0	0	**22**
12	Feb-00	*Lutjanidae*	0	0	1	0	0	0	0	**1**
12	Feb-00	*Scaridae*	0	0	2	0	0	0	0	**2**
12	Feb-00	*Sphyraenidae*	0	0	0	1	1	0	0	**2**

12	Mar-00	*Gerreidae*	0	8	1	0	0	0	0	**9**
12	Mar-00	*Haemulidae*	0	6	9	0	0	0	0	**15**
12	Mar-00	*Lutjanidae*	1	2	2	0	0	2	0	**7**
12	Mar-00	*Scaridae*	2	0	1	0	0	0	0	**3**
12	Mar-00	*Sphyraenidae*	0	0	0	0	1	0	0	**1**
12	Apr-00	*Haemulidae*	28	7	25	0	0	0	0	**60**
12	Apr-00	*Lutjanidae*	3	7	2	1	0	0	0	**13**
12	Apr-00	*Scaridae*	2	2	1	0	0	0	0	**5**
12	Apr-00	*Sphyraenidae*	0	0	0	0	1	0	0	**1**
12	May-00	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
12	May-00	*Gerreidae*	1	6	0	0	0	0	0	**7**
12	May-00	*Haemulidae*	12	1	4	0	0	0	0	**17**
12	May-00	*Lutjanidae*	2	0	1	0	0	0	0	**3**
12	May-00	*Scaridae*	3	0	0	0	0	0	0	**3**
12	May-00	*Sphyraenidae*	1	1	0	0	1	0	0	**3**
12	Jun-00	*Gerreidae*	8	6	1	0	0	0	0	**15**
12	Jun-00	*Haemulidae*	11	7	0	0	0	0	0	**18**
12	Jun-00	*Lutjanidae*	0	2	0	0	0	0	0	**2**
12	Jun-00	*Scaridae*	2	0	0	0	0	0	0	**2**
12	Jul-00	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
12	Jul-00	*Gerreidae*	0	3	5	0	0	0	0	**8**
12	Jul-00	*Haemulidae*	5	27	11	0	0	0	0	**43**
12	Jul-00	*Lutjanidae*	0	2	2	1	5	0	0	**10**
12	Jul-00	*Scaridae*	4	1	0	0	0	0	0	**5**
12	Jul-00	*Sphyraenidae*	0	0	1	1	0	0	0	**2**
12	Aug-00	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
12	Aug-00	*Gerreidae*	4	11	1	0	0	0	0	**16**
12	Aug-00	*Haemulidae*	1	8	0	2	0	0	0	**11**
12	Aug-00	*Labridae*	0	1	0	0	0	0	0	**1**
12	Aug-00	*Lutjanidae*	0	1	3	0	1	0	0	**5**
12	Oct-00	*Gerreidae*	3	0	3	0	0	0	0	**6**
12	Oct-00	*Haemulidae*	16	4	20	1	0	0	0	**41**
12	Oct-00	*Lutjanidae*	7	4	1	9	3	1	0	**25**
12	Oct-00	*Scaridae*	7	4	0	0	0	0	0	**11**
12	Oct-00	*Sphyraenidae*	0	0	2	0	0	0	0	**2**
12	Nov-00	*Chaetodontidae*	1	0	0	0	0	0	0	**1**
12	Nov-00	*Gerreidae*	15	12	6	0	0	0	0	**33**
12	Nov-00	*Haemulidae*	0	16	0	1	0	0	0	**17**
12	Nov-00	*Lutjanidae*	2	6	3	0	0	0	0	**11**
12	Nov-00	*Scaridae*	0	2	0	0	0	0	0	**2**
12	Nov-00	*Sphyraenidae*	0	0	1	0	0	0	0	**1**
12	Dec-00	*Chaetodontidae*	2	0	0	0	0	0	0	**2**
12	Dec-00	*Gerreidae*	56	41	0	0	0	0	0	**97**
12	Dec-00	*Haemulidae*	4	0	0	0	0	0	0	**4**
12	Dec-00	*Labridae*	0	0	1	0	0	0	0	**1**
12	Dec-00	*Lutjanidae*	4	0	1	1	0	0	0	**6**
12	Dec-00	*Sphyraenidae*	0	0	0	0	1	0	0	**1**
12	Jan-01	*Chaetodontidae*	3	0	0	0	0	0	0	**3**
12	Jan-01	*Gerreidae*	34	8	1	0	0	0	0	**43**
12	Jan-01	*Haemulidae*	62	0	0	0	0	0	0	**62**
12	Jan-01	*Lutjanidae*	3	3	2	0	0	0	0	**8**
12	Jan-01	*Scaridae*	0	2	0	0	0	0	0	**2**
12	Jan-01	*Sphyraenidae*	0	0	0	1	0	0	0	**1**
12	Feb-01	*Gerreidae*	0	3	0	0	0	0	0	**3**
12	Feb-01	*Haemulidae*	25	1	1	0	0	0	0	**27**
12	Feb-01	*Lutjanidae*	0	1	0	0	0	0	0	**1**
12	Feb-01	*Scaridae*	10	1	0	0	0	0	0	**11**
12	Mar-01	*Gerreidae*	5	6	0	0	0	0	0	**11**
12	Mar-01	*Haemulidae*	9	0	2	0	0	0	0	**11**
12	Mar-01	*Lutjanidae*	0	0	1	1	0	0	0	**2**
12	Mar-01	*Scaridae*	5	11	0	0	0	0	0	**16**
12	Mar-01	*Tetraodontidae*	0	0	0	1	0	0	1	**2**
										24708

APPENDIX IV – Fish Count data from Artificial Mangrove Unit shade manipulations. Site S = South, Site N = North, Distance = distance from natural mangrove fringe, Shade = % shade

Site	Distance	Sample	Shade	*Species*	<5cm	5-10cm	10-15cm	15-20cm	20-30cm	30-40cm	>40cm	Abund.
S	3m	1	0	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	1	0	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	1	0	*Sparisoma radians*	0	0	6	0	0	0	0	6
S	3m	1	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	1	30	*Lutjanus apodus*	0	0	0	0	7	0	0	7
S	3m	1	30	*Scarus guacamaia*	0	0	0	0	3	0	0	3
S	3m	1	30	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	3m	1	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	1	63	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	1	90	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	3m	2	0	*Scarus coeruleus*	0	0	0	0	1	0	0	1
S	3m	2	0	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	3m	2	0	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	2	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	2	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	2	30	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	2	30	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	3m	2	30	*Lutjanus apodus*	0	0	0	1	3	0	0	4
S	3m	2	30	*Lutjanus cyanopterus*	0	0	0	1	0	0	0	1
S	3m	2	30	*Lutjanus griseus*	0	0	0	0	1	0	0	1
S	3m	2	30	*Pomacanthus paru*	0	0	1	0	0	0	0	1
S	3m	2	30	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	2	63	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	2	63	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	2	63	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	2	73	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	2	73	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
S	3m	2	73	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	3m	2	73	*Sparisoma radians*	0	0	6	0	0	0	0	6
S	3m	2	90	*Acanthurus bahianus*	0	0	1	1	0	0	0	2
S	3m	2	90	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	3m	2	90	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	3m	2	90	*Sparisoma radians*	0	0	5	0	0	0	0	5
S	3m	3	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	3	0	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	3	30	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	3	30	*Acanthurus bahianus*	0	0	2	1	0	0	0	3
S	3m	3	30	*Acanthurus coeruleus*	0	0	0	1	0	0	0	1
S	3m	3	30	*Lutjanus apodus*	0	0	0	3	3	0	0	6
S	3m	3	30	*Lutjanus griseus*	0	0	0	0	1	0	0	1
S	3m	3	30	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
S	3m	3	30	*Stegastes leucostictus*	2	0	0	0	0	0	0	2
S	3m	3	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	3	51	*Scarus croicensis*	1	0	0	0	0	0	0	1
S	3m	3	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	3	63	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	3	63	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	3	63	*Sparisoma radians*	0	0	7	0	0	0	0	7
S	3m	4	0	*Acanthurus bahianus*	0	0	2	1	0	0	0	3
S	3m	4	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	4	0	*Sparisoma radians*	0	1	2	0	0	0	0	3
S	3m	4	30	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	4	30	*Acanthurus bahianus*	0	0	2	1	0	0	0	3
S	3m	4	30	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	4	30	*Lutjanus apodus*	0	0	0	3	5	0	0	8
S	3m	4	30	*Lutjanus griseus*	0	0	0	1	2	0	0	3
S	3m	4	30	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
S	3m	4	30	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	4	30	*Stegastes leucostictus*	2	0	0	0	0	0	0	2
S	3m	4	73	*Mulloidichthys martinicus*	0	0	0	2	0	0	0	2
S	3m	4	73	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	3m	4	73	*Sparisoma radians*	0	0	7	0	0	0	0	7

S	3m	4	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	5	0	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	5	0	*Lutjanus griseus*	0	0	0	4	0	0	0	4
S	3m	5	0	*Mulloidichthys martinicus*	0	0	0	0	1	0	0	1
S	3m	5	30	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	5	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	5	30	*Haemulon flavolineatum*	0	0	0	2	0	0	0	2
S	3m	5	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	3m	5	30	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	5	51	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	5	51	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	5	63	*Sparisoma radians*	0	0	0	1	0	0	0	1
S	3m	5	73	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
S	3m	5	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	5	90	*Lutjanus griseus*	0	0	0	0	1	0	0	1
S	3m	5	90	*Pomacanthus paru*	0	0	0	1	0	0	0	1
S	3m	6	0	*Sparisoma radians*	0	0	6	0	0	0	0	6
S	3m	6	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	6	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	3m	6	30	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	6	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	6	51	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	3m	6	51	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
S	3m	6	73	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	3m	6	73	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	6	90	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	3m	6	90	*Scarus guacamaia*	0	0	0	0	1	0	0	1
S	3m	6	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	7	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	7	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	7	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	7	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	7	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	7	51	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	7	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	7	63	*Sparisoma radians*	0	0	5	0	0	0	0	5
S	3m	7	73	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	7	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	8	0	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	8	0	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	8	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	3m	8	30	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	3m	8	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	8	51	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
S	3m	8	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	8	63	*Sparisoma radians*	0	0	3	2	0	0	0	5
S	3m	8	90	*Acanthurus bahianus*	0	0	1	1	0	0	0	2
S	3m	8	90	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	8	90	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	8	90	*Sparisoma radians*	0	0	7	1	0	0	0	8
S	3m	9	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	9	30	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	9	30	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	9	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	9	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	9	51	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
S	3m	9	90	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	9	90	*Scarus coeruleus*	0	0	0	0	1	0	0	1
S	3m	9	90	*Scarus guacamaia*	0	0	0	1	1	0	0	2
S	3m	9	90	*Sparisoma radians*	0	0	9	0	0	0	0	9
S	3m	10	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	10	0	*Haemulon parrai*	0	0	0	0	1	0	0	1
S	3m	10	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	10	30	*Gerres cinereus*	0	0	2	0	0	0	0	2
S	3m	10	30	*Scarus coeruleus*	0	0	0	0	1	0	0	1
S	3m	10	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	10	30	*Stegastes leucostictus*	2	0	0	0	0	0	0	2
S	3m	10	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	10	73	*Acanthurus bahianus*	0	0	2	0	0	0	0	2

S	3m	10	73	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	10	73	*Mulloidichthys martinicus*	0	0	1	1	0	0	0	2
S	3m	10	73	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	3m	10	73	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	11	0	*Calamus bajonado*	0	1	1	0	0	0	0	2
S	3m	11	0	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	11	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	11	51	*Calamus bajonado*	0	1	1	0	0	0	0	2
S	3m	11	51	*Haemulon flavolineatum*	0	0	2	0	0	0	0	2
S	3m	11	51	*Haemulon sciurus*	0	0	2	0	0	0	0	2
S	3m	11	63	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	3m	11	63	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	11	90	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	11	90	*Haemulon sciurus*	0	0	0	6	0	0	0	6
S	3m	11	90	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	11	90	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	3m	11	90	*Sparisoma radians*	0	2	0	1	0	0	0	3
S	3m	12	30	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	12	30	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	12	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	12	30	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	12	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	12	51	*Haemulon sciurus*	0	0	2	0	0	0	0	2
S	3m	12	51	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	12	51	*Lutjanus griseus*	0	0	0	3	0	0	0	3
S	3m	12	73	*Caranx latus*	0	0	8	0	0	0	0	8
S	3m	12	90	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	12	90	*Haemulon sciurus*	0	0	0	4	0	0	0	4
S	3m	12	90	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	3m	12	90	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	3m	12	90	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	3m	13	0	*Gerres cinereus*	0	2	0	0	0	0	0	2
S	3m	13	30	*Calamus bajonado*	0	1	1	0	0	0	0	2
S	3m	13	30	*Gerres cinereus*	0	2	0	0	0	0	0	2
S	3m	13	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	13	30	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	3m	13	51	*Haemulon parrai*	0	0	0	3	2	0	0	5
S	3m	13	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	13	51	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	3m	13	63	*Calamus bajonado*	0	1	1	0	0	0	0	2
S	3m	13	63	*Scarus guacamaia*	0	0	0	2	0	0	0	2
S	3m	13	63	*Sparisoma radians*	0	1	3	1	0	0	0	5
S	3m	13	73	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	13	90	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	13	90	*Haemulon sciurus*	0	0	0	16	0	0	0	16
S	3m	13	90	*Lutjanus apodus*	0	0	0	3	0	0	0	3
S	3m	13	90	*Lutjanus griseus*	0	0	0	3	0	0	0	3
S	3m	14	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	3m	14	30	*Lutjanus griseus*	0	0	0	0	4	0	0	4
S	3m	14	51	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	14	51	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	3m	14	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	14	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	14	51	*Pomacanthus arcuatus*	0	0	0	1	0	0	0	1
S	3m	14	51	*Scarus coeruleus*	0	0	0	1	0	0	0	1
S	3m	14	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	14	63	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	14	63	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	14	63	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	14	63	*Lutjanus griseus*	0	0	0	4	0	0	0	4
S	3m	14	63	*Scarus guacamaia*	0	0	0	0	4	0	0	4
S	3m	14	63	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	14	73	*Haemulon sciurus*	0	0	0	9	0	0	0	9
S	3m	14	90	*Caranx latus*	0	0	8	0	0	0	0	8
S	3m	14	90	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	3m	14	90	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	3m	15	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	15	30	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	15	30	*Gerres cinereus*	0	0	1	0	0	0	0	1

S	3m	15	30	*Lutjanus apodus*	0	0	0	4	0	0	0	4
S	3m	15	30	*Lutjanus griseus*	0	0	0	2	8	0	0	10
S	3m	15	30	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	15	51	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	15	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	15	51	*Scarus coeruleus*	0	0	0	1	0	0	0	1
S	3m	15	51	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	3m	15	63	*Sphyraena barracuda*	0	0	0	0	0	1	0	1
S	3m	15	90	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	15	90	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	3m	15	90	*Lutjanus apodus*	0	0	0	9	0	0	0	9
S	3m	15	90	*Lutjanus cyanopterus*	0	0	0	1	0	0	0	1
S	3m	15	90	*Lutjanus griseus*	0	0	0	6	0	0	0	6
S	3m	15	90	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	15	90	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	3m	16	0	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
S	3m	16	30	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	16	30	*Lutjanus apodus*	0	0	0	0	1	0	0	1
S	3m	16	30	*Lutjanus griseus*	0	0	0	0	9	0	0	9
S	3m	16	30	*Scarus guacamaia*	0	0	0	2	0	0	0	2
S	3m	16	51	*Lutjanus griseus*	0	0	0	2	0	0	0	2
S	3m	16	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	16	51	*Scarus coeruleus*	0	0	0	1	0	0	0	1
S	3m	16	51	*Scarus guacamaia*	0	0	1	3	0	0	0	4
S	3m	16	51	*Sparisoma radians*	0	2	3	0	0	0	0	5
S	3m	16	63	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	16	63	*Lutjanus griseus*	0	0	0	0	5	0	0	5
S	3m	16	73	*Sparisoma radians*	0	2	5	0	0	0	0	7
S	3m	16	90	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	3m	16	90	*Lutjanus apodus*	0	0	0	3	5	0	0	8
S	3m	16	90	*Lutjanus griseus*	0	0	0	1	1	0	0	2
S	3m	16	90	*Scarus guacamaia*	0	0	0	2	0	0	0	2
S	3m	16	90	*Sparisoma radians*	0	1	2	0	0	0	0	3
S	3m	17	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	17	30	*Acanthurus bahianus*	0	0	3	0	0	0	0	3
S	3m	17	30	*Calamus bajonado*	0	0	3	0	0	0	0	3
S	3m	17	30	*Lutjanus griseus*	0	0	0	2	4	0	0	6
S	3m	17	30	*Sparisoma radians*	0	1	5	0	0	0	0	6
S	3m	17	51	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	17	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	17	51	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	17	51	*Mulloidichthys martinicus*	0	0	2	0	0	0	0	2
S	3m	17	90	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	17	90	*Lutjanus apodus*	0	0	0	3	4	0	0	7
S	3m	17	90	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
S	3m	17	90	*Lutjanus griseus*	0	0	0	2	3	0	0	5
S	3m	17	90	*Pomacanthus arcuatus*	0	0	0	1	0	0	0	1
S	3m	17	90	*Sparisoma radians*	0	1	2	0	0	0	0	3
S	3m	17	90	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	3m	18	0	*Calamus bajonado*	0	0	3	0	0	0	0	3
S	3m	18	0	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
S	3m	18	0	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	3m	18	0	*Sparisoma radians*	0	0	2	1	0	0	0	3
S	3m	18	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	18	30	*Lutjanus griseus*	0	0	0	0	3	0	0	3
S	3m	18	51	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	18	51	*Caranx latus*	0	0	6	0	0	0	0	6
S	3m	18	51	*Pomacanthus arcuatus*	0	0	1	0	0	0	0	1
S	3m	18	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	18	63	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	18	63	*Lutjanus griseus*	0	0	0	0	3	0	0	3
S	3m	18	63	*Sparisoma radians*	0	0	4	1	0	0	0	5
S	3m	18	73	*Calamus bajonado*	0	1	0	0	0	0	0	1
S	3m	18	73	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	3m	18	73	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	18	90	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	18	90	*Lutjanus apodus*	0	0	0	7	2	0	0	9
S	3m	18	90	*Lutjanus griseus*	0	0	0	0	1	0	0	1
S	3m	18	90	*Stegastes leucostictus*	1	0	0	0	0	0	0	1

S	3m	19	0	*Calamus bajonado*	0	2	2	0	0	0	0	4
S	3m	19	0	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	3m	19	0	*Mulloidichthys martinicus*	0	0	1	1	0	0	0	2
S	3m	19	0	*Scarus guacamaia*	0	0	0	0	1	0	0	1
S	3m	19	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	19	30	*Lutjanus griseus*	0	0	0	0	3	0	0	3
S	3m	19	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	19	51	*Sparisoma radians*	0	0	6	0	0	0	0	6
S	3m	19	63	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	19	63	*Scarus guacamaia*	0	0	0	0	1	0	0	1
S	3m	19	63	*Sparisoma radians*	0	0	3	3	0	0	0	6
S	3m	19	73	*Lutjanus griseus*	0	0	0	0	1	0	0	1
S	3m	19	90	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	19	90	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	19	90	*Lutjanus apodus*	0	0	0	7	0	0	0	7
S	3m	19	90	*Lutjanus griseus*	0	0	0	0	2	0	0	2
S	3m	19	90	*Sparisoma radians*	0	0	3	1	0	0	0	4
S	3m	19	90	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	3m	20	0	*Calamus bajonado*	0	1	2	0	0	0	0	3
S	3m	20	0	*Lutjanus griseus*	0	0	0	3	0	0	0	3
S	3m	20	0	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	20	0	*Scarus guacamaia*	0	0	0	2	1	0	0	3
S	3m	20	30	*Lutjanus griseus*	0	0	0	0	3	0	0	3
S	3m	20	30	*Scarus coeruleus*	0	0	0	1	0	0	0	1
S	3m	20	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	20	51	*Sparisoma radians*	0	3	1	1	0	0	0	5
S	3m	20	63	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	20	63	*Calamus bajonado*	0	1	0	0	0	0	0	1
S	3m	20	63	*Sparisoma radians*	0	3	1	0	0	0	0	4
S	3m	20	90	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	20	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	20	90	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	3m	20	90	*Lutjanus apodus*	0	0	0	6	2	0	0	8
S	3m	20	90	*Lutjanus griseus*	0	0	0	0	2	0	0	2
S	3m	20	90	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	3m	21	30	*Haemulon sciurus*	0	0	2	0	0	0	0	2
S	3m	21	30	*Sparisoma radians*	0	2	7	0	0	0	0	9
S	3m	21	51	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	21	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	21	51	*Haemulon flavolineatum*	0	0	1	0	0	0	0	1
S	3m	21	51	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	21	63	*Haemulon flavolineatum*	0	0	1	0	0	0	0	1
S	3m	21	63	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	3m	21	63	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	21	73	*Calamus bajonado*	0	1	2	0	0	0	0	3
S	3m	21	73	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	21	73	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	21	90	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	21	90	*Gerres cinereus*	0	1	0	0	0	0	0	1
S	3m	21	90	*Haemulon flavolineatum*	0	0	1	0	0	0	0	1
S	3m	21	90	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	3m	22	0	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	22	0	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	22	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	22	0	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	22	30	*Scarus taeniopterus*	2	0	0	0	0	0	0	2
S	3m	22	51	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	22	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	22	51	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	3m	22	51	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	3m	22	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	22	63	*Abudefduf saxatilis*	0	0	0	1	0	0	0	1
S	3m	22	63	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	3m	22	63	*Sparisoma radians*	0	1	3	0	0	0	0	4
S	3m	22	63	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	3m	22	73	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	22	73	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	22	73	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	3m	22	73	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1

S	3m	22	73	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	22	90	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	22	90	*Calamus bajonado*	0	0	3	0	0	0	0	3
S	3m	22	90	*Lutjanus griseus*	0	0	0	2	0	0	0	2
S	3m	22	90	*Ocyurus chrysurus*	0	0	0	2	0	0	0	2
S	3m	22	90	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	23	0	*Calamus bajonado*	0	1	0	0	0	0	0	1
S	3m	23	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	23	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	23	63	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	3m	23	73	*Sparisoma radians*	0	1	2	0	0	0	0	3
S	3m	23	90	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	23	90	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	23	90	*Lutjanus griseus*	0	0	0	2	0	0	0	2
S	3m	23	90	*Mulloidichthys martinicus*	0	0	2	0	0	0	0	2
S	3m	23	90	*Sparisoma radians*	0	1	8	1	0	0	0	10
S	3m	24	0	*Gerres cinereus*	0	1	0	0	0	0	0	1
S	3m	24	30	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	24	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	24	51	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	24	51	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	3m	24	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	24	63	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	24	63	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	3m	24	63	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	3m	24	73	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	24	73	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	24	90	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	24	90	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	24	90	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	24	90	*Lutjanus griseus*	0	0	0	2	0	0	0	2
S	3m	24	90	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	24	90	*Sparisoma radians*	0	3	2	1	0	0	0	6
S	3m	25	0	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	25	0	*Sparisoma radians*	0	2	0	0	0	0	0	2
S	3m	25	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	25	30	*Sparisoma radians*	0	0	0	1	0	0	0	1
S	3m	25	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	25	63	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	25	63	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	25	63	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	3m	25	63	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	3m	25	63	*Sparisoma radians*	0	0	6	0	0	0	0	6
S	3m	25	63	*Stegastes leucostictus*	3	0	0	0	0	0	0	3
S	3m	25	73	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	25	73	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	3m	25	90	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	25	90	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	25	90	*Gerres cinereus*	0	1	0	0	0	0	0	1
S	3m	25	90	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	25	90	*Lutjanus griseus*	0	0	0	3	0	0	0	3
S	3m	26	0	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	26	0	*Calamus bajonado*	0	0	4	0	0	0	0	4
S	3m	26	0	*Lutjanus griseus*	0	0	0	2	0	0	0	2
S	3m	26	63	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	26	63	*Haemulon sciurus*	0	0	0	8	0	0	0	8
S	3m	26	63	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	26	63	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	3m	26	73	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	26	73	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	3m	26	90	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	26	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	26	90	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	26	90	*Lutjanus griseus*	0	0	0	3	0	0	0	3
S	3m	26	90	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	3m	26	90	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	27	0	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	27	0	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	27	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1

S	3m	27	30	*Pomacanthus arcuatus*	0	0	0	1	0	0	0	1
S	3m	27	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	27	51	*Calamus bajonado*	0	0	5	0	0	0	0	5
S	3m	27	51	*Lutjanus griseus*	0	0	0	0	2	0	0	2
S	3m	27	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	27	51	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	27	63	*Haemulon parrai*	0	0	0	3	0	0	0	3
S	3m	27	63	*Haemulon sciurus*	0	0	0	18	0	0	0	18
S	3m	27	63	*Lutjanus apodus*	0	0	0	5	0	0	0	5
S	3m	27	73	*Haemulon sciurus*	0	0	0	5	0	0	0	5
S	3m	27	73	*Lutjanus apodus*	0	0	0	5	0	0	0	5
S	3m	27	73	*Lutjanus griseus*	0	0	0	0	1	0	0	1
S	3m	27	73	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	27	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	27	90	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	27	90	*Lutjanus griseus*	0	0	0	2	2	0	0	4
S	3m	27	90	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	3m	28	0	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	28	0	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	28	30	*Haemulon sciurus*	0	0	0	6	0	0	0	6
S	3m	28	30	*Lutjanus apodus*	0	0	0	0	1	0	0	1
S	3m	28	30	*Lutjanus griseus*	0	0	0	0	2	0	0	2
S	3m	28	30	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	3m	28	51	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	28	51	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	28	51	*Lutjanus griseus*	0	0	0	0	4	2	0	6
S	3m	28	63	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	28	63	*Haemulon sciurus*	0	0	0	14	0	0	0	14
S	3m	28	63	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	3m	28	63	*Pomacanthus arcuatus*	0	0	0	2	0	0	0	2
S	3m	28	63	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	3m	28	73	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	28	73	*Haemulon parrai*	0	0	0	2	0	0	0	2
S	3m	28	73	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	3m	28	73	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	28	73	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	28	90	*Haemulon sciurus*	0	0	0	4	0	0	0	4
S	3m	28	90	*Lutjanus apodus*	0	0	0	10	5	0	0	15
S	3m	28	90	*Lutjanus griseus*	0	0	0	3	5	0	0	8
S	3m	28	90	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	29	0	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	29	0	*Calamus bajonado*	0	1	2	0	0	0	0	3
S	3m	29	0	*Sparisoma radians*	0	0	2	3	0	0	0	5
S	3m	29	30	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	29	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	29	51	*Calamus bajonado*	0	0	3	0	0	0	0	3
S	3m	29	51	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
S	3m	29	51	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	3m	29	63	*Haemulon sciurus*	0	0	0	7	0	0	0	7
S	3m	29	63	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	29	63	*Lutjanus griseus*	0	0	0	0	3	0	0	3
S	3m	29	63	*Sparisoma radians*	0	0	1	3	0	0	0	4
S	3m	29	73	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	29	73	*Caranx latus*	0	0	6	0	0	0	0	6
S	3m	29	73	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	29	90	*Lutjanus apodus*	0	0	0	3	0	0	0	3
S	3m	29	90	*Lutjanus griseus*	0	0	0	0	6	0	0	6
S	3m	30	0	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	30	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	30	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	30	51	*Calamus bajonado*	0	0	5	0	0	0	0	5
S	3m	30	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	30	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	30	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	30	63	*Haemulon sciurus*	0	0	0	10	0	0	0	10
S	3m	30	63	*Lutjanus apodus*	0	0	0	4	0	0	0	4
S	3m	30	63	*Lutjanus griseus*	0	0	0	2	6	0	0	8
S	3m	30	63	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	3m	30	63	*Sparisoma radians*	0	2	2	0	0	0	0	4

S	3m	30	73	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	30	73	*Caranx latus*	0	0	6	0	0	0	0	6
S	3m	30	73	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	3m	30	73	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	30	90	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	30	90	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	3m	30	90	*Lutjanus apodus*	0	0	0	3	0	0	0	3
S	3m	30	90	*Lutjanus griseus*	0	0	0	0	7	0	0	7
S	3m	30	90	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	3m	30	90	*Sparisoma radians*	0	0	5	0	0	0	0	5
N	3m	31	30	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	3m	31	30	*Lutjanus apodus*	0	0	0	22	0	0	0	22
N	3m	31	30	*Lutjanus griseus*	0	0	0	12	0	0	0	12
N	3m	31	30	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	31	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	31	51	*Lutjanus apodus*	0	0	0	11	0	0	0	11
N	3m	31	51	*Lutjanus griseus*	0	0	0	4	0	0	0	4
N	3m	31	51	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	31	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	31	90	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	31	90	*Lutjanus apodus*	0	0	0	20	0	0	0	20
N	3m	31	90	*Lutjanus griseus*	0	0	0	8	0	0	0	8
N	3m	31	90	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	32	0	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	32	0	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	32	30	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	3m	32	30	*Lutjanus apodus*	0	0	0	19	2	0	0	21
N	3m	32	30	*Lutjanus griseus*	0	0	0	6	3	0	0	9
N	3m	32	51	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	32	51	*Lutjanus apodus*	0	0	1	14	2	0	0	17
N	3m	32	51	*Lutjanus griseus*	0	0	0	2	2	0	0	4
N	3m	32	51	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	32	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	32	51	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	3m	32	63	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	3m	32	73	*Sphyraena barracuda*	0	0	0	0	0	1	0	1
N	3m	32	90	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	32	90	*Lutjanus apodus*	0	0	3	23	0	0	0	26
N	3m	32	90	*Lutjanus griseus*	0	0	0	5	0	0	0	5
N	3m	33	0	*Lutjanus griseus*	0	0	1	0	0	0	0	1
N	3m	33	30	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
N	3m	33	30	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	3m	33	30	*Lutjanus apodus*	0	0	0	16	4	0	0	20
N	3m	33	30	*Lutjanus griseus*	0	0	0	2	4	0	0	6
N	3m	33	30	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	3m	33	51	*Lutjanus apodus*	0	0	2	12	4	0	0	18
N	3m	33	51	*Lutjanus griseus*	0	0	0	4	2	0	0	6
N	3m	33	51	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	33	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	33	63	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	33	73	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	33	73	*Sphyraena barracuda*	0	0	0	0	0	1	0	1
N	3m	33	90	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	33	90	*Lutjanus apodus*	0	0	0	23	2	0	0	25
N	3m	33	90	*Lutjanus griseus*	0	0	0	6	4	0	0	10
N	3m	34	0	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	34	30	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	3m	34	30	*Lutjanus apodus*	0	0	2	17	5	0	0	24
N	3m	34	30	*Lutjanus griseus*	0	0	2	8	5	0	0	15
N	3m	34	30	*Sparisoma radians*	0	0	0	1	0	0	0	1
N	3m	34	51	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
N	3m	34	51	*Lutjanus apodus*	0	0	0	13	4	0	0	17
N	3m	34	51	*Lutjanus griseus*	0	0	0	3	6	0	0	9
N	3m	34	51	*Sparisoma radians*	0	0	1	1	0	0	0	2
N	3m	34	63	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
N	3m	34	63	*Lactophrys triqueter*	0	0	0	0	1	0	0	1
N	3m	34	63	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	34	73	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	34	73	*Sphyraena barracuda*	0	0	0	0	0	1	0	1

N	3m	34	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	34	90	*Lutjanus apodus*	0	0	0	19	0	0	0	19
N	3m	34	90	*Lutjanus griseus*	0	0	0	6	0	0	0	6
N	3m	35	30	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
N	3m	35	30	*Haemulon flavolineatum*	0	0	0	2	0	0	0	2
N	3m	35	30	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	3m	35	30	*Lutjanus apodus*	0	0	0	19	3	0	0	22
N	3m	35	30	*Lutjanus griseus*	0	0	0	6	6	0	0	12
N	3m	35	51	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	35	51	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	3m	35	51	*Lutjanus apodus*	0	0	2	15	3	0	0	20
N	3m	35	51	*Lutjanus griseus*	0	0	0	6	5	0	0	11
N	3m	35	51	*Sparisoma radians*	0	0	0	1	0	0	0	1
N	3m	35	51	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	3m	35	63	*Lutjanus apodus*	0	0	0	9	0	0	0	9
N	3m	35	63	*Lutjanus griseus*	0	0	0	2	4	0	0	6
N	3m	35	63	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	35	63	*Sparisoma radians*	0	0	0	1	0	0	0	1
N	3m	35	73	*Lutjanus apodus*	0	0	0	2	1	0	0	3
N	3m	35	73	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	35	73	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
N	3m	35	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	35	90	*Lutjanus apodus*	0	0	0	2	0	0	0	2
N	3m	35	90	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	35	90	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	36	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	36	0	*Sparisoma radians*	0	1	0	0	0	0	0	1
N	3m	36	30	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
N	3m	36	30	*Haemulon flavolineatum*	0	0	0	2	0	0	0	2
N	3m	36	30	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	3m	36	30	*Lutjanus apodus*	0	0	4	23	2	0	0	29
N	3m	36	30	*Lutjanus griseus*	0	0	0	10	5	0	0	15
N	3m	36	30	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	36	30	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
N	3m	36	51	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	36	51	*Lutjanus apodus*	0	0	0	16	6	0	0	22
N	3m	36	51	*Lutjanus griseus*	0	0	0	5	4	0	0	9
N	3m	36	51	*Mulloidichthys martinicus*	0	0	0	0	1	0	0	1
N	3m	36	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	36	51	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	3m	36	63	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	36	63	*Lutjanus apodus*	0	0	0	7	1	0	0	8
N	3m	36	63	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	36	63	*Sparisoma radians*	0	0	2	1	0	0	0	3
N	3m	36	73	*Lutjanus apodus*	0	0	0	0	1	0	0	1
N	3m	36	73	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	36	73	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
N	3m	36	90	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	36	90	*Lutjanus apodus*	0	0	0	4	0	0	0	4
N	3m	37	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	37	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	37	30	*Haemulon flavolineatum*	0	0	0	2	0	0	0	2
N	3m	37	30	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	3m	37	30	*Lutjanus apodus*	0	0	4	18	3	0	0	25
N	3m	37	30	*Lutjanus griseus*	0	0	0	6	3	0	0	9
N	3m	37	30	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	37	30	*Sparisoma radians*	0	0	0	1	0	0	0	1
N	3m	37	30	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
N	3m	37	51	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
N	3m	37	51	*Lutjanus apodus*	0	0	3	22	4	0	0	29
N	3m	37	51	*Lutjanus griseus*	0	0	0	3	3	0	0	6
N	3m	37	51	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	3m	37	63	*Lutjanus apodus*	0	0	0	18	3	0	0	21
N	3m	37	63	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	37	63	*Mulloidichthys martinicus*	0	0	0	0	1	0	0	1
N	3m	37	63	*Sparisoma radians*	0	0	1	3	0	0	0	4
N	3m	37	73	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	37	73	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	37	73	*Sphyraena barracuda*	0	0	0	0	0	0	1	1

N	3m	37	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	37	90	*Lutjanus apodus*	0	0	0	4	0	0	0	4
N	3m	37	90	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	37	90	*Sparisoma radians*	0	0	0	1	0	0	0	1
N	3m	38	30	*Haemulon flavolineatum*	0	0	0	2	0	0	0	2
N	3m	38	30	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	3m	38	30	*Lutjanus apodus*	0	0	4	12	2	0	0	18
N	3m	38	30	*Lutjanus griseus*	0	0	0	8	4	0	0	12
N	3m	38	30	*Sparisoma radians*	0	0	1	2	0	0	0	3
N	3m	38	30	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	3m	38	51	*Lutjanus apodus*	0	0	2	18	6	0	0	26
N	3m	38	51	*Lutjanus griseus*	0	0	0	3	5	0	0	8
N	3m	38	51	*Mulloidichthys martinicus*	0	0	1	1	0	0	0	2
N	3m	38	51	*Sparisoma radians*	0	0	1	2	0	0	0	3
N	3m	38	51	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	3m	38	63	*Lutjanus apodus*	0	0	0	0	2	0	0	2
N	3m	38	63	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	38	73	*Gerres cinereus*	0	0	3	4	0	0	0	7
N	3m	38	73	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	38	90	*Lutjanus apodus*	0	0	1	3	0	0	0	4
N	3m	38	90	*Lutjanus griseus*	0	0	0	3	1	0	0	4
N	3m	38	90	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	3m	39	30	*Gerres cinereus*	0	0	0	2	0	0	0	2
N	3m	39	30	*Haemulon flavolineatum*	0	0	0	2	0	0	0	2
N	3m	39	30	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	3m	39	30	*Lutjanus apodus*	0	0	0	14	3	0	0	17
N	3m	39	30	*Lutjanus griseus*	0	0	0	6	2	0	0	8
N	3m	39	30	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
N	3m	39	51	*Lutjanus apodus*	0	0	0	9	6	0	0	15
N	3m	39	51	*Lutjanus griseus*	0	0	0	6	2	0	0	8
N	3m	39	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	39	63	*Lutjanus apodus*	0	0	0	0	2	0	0	2
N	3m	39	63	*Lutjanus griseus*	0	0	0	0	2	0	0	2
N	3m	39	73	*Lutjanus griseus*	0	0	0	0	2	0	0	2
N	3m	39	73	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	3m	39	90	*Lutjanus apodus*	0	0	0	2	0	0	0	2
N	3m	39	90	*Lutjanus griseus*	0	0	0	3	6	0	0	9
N	3m	39	90	*Sphyraena barracuda*	0	0	0	0	0	1	0	1
N	3m	40	0	*Lutjanus griseus*	0	0	0	2	0	0	0	2
N	3m	40	30	*Haemulon flavolineatum*	0	0	0	2	0	0	0	2
N	3m	40	30	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	3m	40	30	*Lutjanus apodus*	0	0	0	9	2	0	0	11
N	3m	40	30	*Lutjanus griseus*	0	0	0	7	0	0	0	7
N	3m	40	30	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
N	3m	40	51	*Lutjanus apodus*	0	0	0	5	3	0	0	8
N	3m	40	51	*Lutjanus griseus*	0	0	0	0	7	0	0	7
N	3m	40	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	40	63	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	40	63	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	3m	40	73	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	40	73	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	3m	40	73	*Sparisoma radians*	0	0	0	2	0	0	0	2
N	3m	40	90	*Gerres cinereus*	0	0	0	3	0	0	0	3
N	3m	40	90	*Lutjanus apodus*	0	0	3	0	0	0	0	3
N	3m	40	90	*Lutjanus griseus*	0	0	0	5	0	0	0	5
N	3m	40	90	*Sparisoma radians*	0	0	1	3	0	0	0	4
N	3m	41	30	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	41	51	*Lutjanus apodus*	0	0	0	6	3	0	0	9
N	3m	41	51	*Lutjanus griseus*	0	0	0	5	8	0	0	13
N	3m	41	63	*Lutjanus griseus*	0	0	0	4	0	0	0	4
N	3m	41	63	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	41	73	*Lutjanus apodus*	0	0	0	10	4	0	0	14
N	3m	41	73	*Lutjanus griseus*	0	0	0	4	0	0	0	4
N	3m	41	73	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	3m	41	73	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
N	3m	41	90	*Lutjanus apodus*	0	0	0	13	4	0	0	17
N	3m	41	90	*Lutjanus griseus*	0	0	0	0	6	0	0	6
N	3m	42	30	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	42	51	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1

N	3m	42	51	*Gerres cinereus*	0	0	3	0	0	0	0	3
N	3m	42	51	*Lutjanus apodus*	0	0	0	9	1	0	0	10
N	3m	42	51	*Lutjanus griseus*	0	0	0	2	5	0	0	7
N	3m	42	51	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	3m	42	63	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
N	3m	42	63	*Lutjanus apodus*	0	0	0	0	2	0	0	2
N	3m	42	63	*Lutjanus griseus*	0	0	0	0	10	0	0	10
N	3m	42	63	*Scarus guacamaia*	0	0	0	0	4	0	0	4
N	3m	42	63	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	3m	42	73	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	42	73	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	42	73	*Lutjanus apodus*	0	0	0	12	0	0	0	12
N	3m	42	73	*Lutjanus griseus*	0	0	0	1	2	0	0	3
N	3m	42	73	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	3m	42	73	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
N	3m	42	90	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	3m	42	90	*Lutjanus apodus*	0	0	0	15	4	0	0	19
N	3m	42	90	*Lutjanus griseus*	0	0	0	2	7	0	0	9
N	3m	43	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	43	30	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	43	30	*Lutjanus griseus*	0	0	0	6	5	0	0	11
N	3m	43	51	*Gerres cinereus*	0	0	3	0	0	0	0	3
N	3m	43	51	*Lutjanus apodus*	0	0	0	8	0	0	0	8
N	3m	43	51	*Lutjanus griseus*	0	0	0	6	5	0	0	11
N	3m	43	51	*Scarus guacamaia*	0	0	0	1	1	0	0	2
N	3m	43	51	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	3m	43	73	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	3m	43	73	*Lutjanus apodus*	0	0	0	1	6	0	0	7
N	3m	43	73	*Lutjanus griseus*	0	0	0	2	3	0	0	5
N	3m	43	73	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
N	3m	43	90	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	43	90	*Lutjanus apodus*	0	0	0	0	8	0	0	8
N	3m	43	90	*Lutjanus griseus*	0	0	0	0	8	0	0	8
N	3m	43	90	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	3m	44	30	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	44	51	*Lutjanus apodus*	0	0	0	8	0	0	0	8
N	3m	44	51	*Lutjanus griseus*	0	0	0	12	0	3	0	15
N	3m	44	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	3m	44	63	*Lutjanus griseus*	0	0	0	0	4	0	0	4
N	3m	44	73	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	3m	44	73	*Lutjanus apodus*	0	0	0	13	0	0	0	13
N	3m	44	73	*Lutjanus griseus*	0	0	0	2	3	0	0	5
N	3m	44	73	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	3m	44	73	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
N	3m	44	90	*Haemulon sciurus*	0	0	0	0	1	0	0	1
N	3m	44	90	*Lutjanus apodus*	0	0	0	7	4	0	0	11
N	3m	44	90	*Lutjanus griseus*	0	0	0	6	0	1	0	7
N	3m	45	0	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	3m	45	30	*Lutjanus apodus*	0	0	0	2	6	0	0	8
N	3m	45	30	*Lutjanus griseus*	0	0	0	0	2	0	0	2
N	3m	45	51	*Gerres cinereus*	0	0	0	0	1	0	0	1
N	3m	45	51	*Lutjanus apodus*	0	0	0	6	0	0	0	6
N	3m	45	51	*Lutjanus griseus*	0	0	0	4	0	2	0	6
N	3m	45	63	*Lutjanus griseus*	0	0	0	1	2	0	0	3
N	3m	45	73	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	45	73	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	45	73	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	45	73	*Lutjanus apodus*	0	0	0	10	0	0	0	10
N	3m	45	73	*Lutjanus griseus*	0	0	0	11	2	0	0	13
N	3m	45	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	45	90	*Lutjanus apodus*	0	0	0	12	2	0	0	14
N	3m	45	90	*Lutjanus griseus*	0	0	0	2	0	2	0	4
N	3m	46	0	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	3m	46	30	*Gerres cinereus*	0	3	0	0	0	0	0	3
N	3m	46	30	*Lutjanus apodus*	0	0	0	3	4	0	0	7
N	3m	46	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	46	51	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	46	63	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
N	3m	46	63	*Gerres cinereus*	0	0	2	0	0	0	0	2

N	3m	46	63	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	46	73	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	46	73	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	3m	46	73	*Gerres cinereus*	0	2	0	0	0	0	0	2
N	3m	46	73	*Lutjanus apodus*	0	0	0	1	4	0	0	5
N	3m	46	73	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	3m	46	73	*Lutjanus griseus*	0	0	1	3	4	0	0	8
N	3m	46	73	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
N	3m	46	90	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	46	90	*Haemulon sciurus*	0	0	0	0	1	0	0	1
N	3m	46	90	*Lutjanus apodus*	0	0	0	8	4	0	0	12
N	3m	46	90	*Lutjanus griseus*	0	0	0	2	4	2	0	8
N	3m	47	0	*Gerres cinereus*	0	6	0	0	0	0	0	6
N	3m	47	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	47	30	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	47	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
N	3m	47	51	*Lutjanus apodus*	0	0	0	7	0	0	0	7
N	3m	47	51	*Lutjanus griseus*	0	0	0	5	0	0	0	5
N	3m	47	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	47	73	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	47	73	*Haemulon sciurus*	0	0	0	0	1	0	0	1
N	3m	47	73	*Lutjanus apodus*	0	0	4	8	4	0	0	16
N	3m	47	73	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	3m	47	73	*Lutjanus griseus*	0	0	2	10	1	2	0	15
N	3m	47	73	*Scarus guacamaia*	0	0	0	1	1	0	0	2
N	3m	47	90	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	3m	47	90	*Haemulon sciurus*	0	0	0	0	1	0	0	1
N	3m	47	90	*Lutjanus apodus*	0	0	0	6	3	0	0	9
N	3m	47	90	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	3m	47	90	*Lutjanus griseus*	0	0	0	7	4	0	0	11
N	3m	48	0	*Scarus guacamaia*	0	0	0	0	5	0	0	5
N	3m	48	30	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	3m	48	30	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	48	51	*Gerres cinereus*	0	2	0	0	0	0	0	2
N	3m	48	51	*Lutjanus apodus*	0	0	0	10	0	0	0	10
N	3m	48	51	*Lutjanus griseus*	0	0	2	8	0	0	0	10
N	3m	48	73	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
N	3m	48	73	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	3m	48	73	*Haemulon sciurus*	0	0	0	1	2	0	0	3
N	3m	48	73	*Lutjanus apodus*	0	0	0	9	0	0	0	9
N	3m	48	73	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	3m	48	73	*Lutjanus griseus*	0	0	0	6	3	3	0	12
N	3m	48	73	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	48	90	*Gerres cinereus*	0	4	0	0	0	0	0	4
N	3m	48	90	*Lutjanus apodus*	0	0	0	6	3	0	0	9
N	3m	48	90	*Lutjanus griseus*	0	0	0	2	7	2	0	11
N	3m	48	90	*Mulloidichthys martinicus*	0	1	0	0	0	0	0	1
N	3m	48	90	*Scarus guacamaia*	0	0	0	0	4	0	0	4
N	3m	49	0	*Gerres cinereus*	0	6	2	0	0	0	0	8
N	3m	49	30	*Gerres cinereus*	0	3	0	0	0	0	0	3
N	3m	49	30	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	49	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
N	3m	49	51	*Gerres cinereus*	0	3	0	0	0	0	0	3
N	3m	49	51	*Lutjanus apodus*	0	0	6	4	0	0	0	10
N	3m	49	51	*Lutjanus griseus*	0	0	1	0	0	0	0	1
N	3m	49	63	*Gerres cinereus*	0	3	0	0	0	0	0	3
N	3m	49	73	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
N	3m	49	73	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	49	73	*Haemulon sciurus*	0	0	0	0	2	0	0	2
N	3m	49	73	*Lutjanus apodus*	0	0	2	6	0	0	0	8
N	3m	49	73	*Lutjanus griseus*	0	0	0	4	8	0	0	12
N	3m	49	73	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	49	73	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
N	3m	49	90	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	49	90	*Lutjanus apodus*	0	2	14	4	0	0	0	20
N	3m	49	90	*Lutjanus griseus*	0	0	2	3	6	0	0	11
N	3m	49	90	*Scarus guacamaia*	0	0	0	0	4	2	0	6
N	3m	50	0	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	3m	50	30	*Gerres cinereus*	0	1	0	0	0	0	0	1

N	3m	50	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
N	3m	50	51	*Gerres cinereus*	0	5	0	0	0	0	0	5
N	3m	50	51	*Lutjanus apodus*	0	0	0	7	0	0	0	7
N	3m	50	51	*Lutjanus griseus*	0	0	0	8	0	0	0	8
N	3m	50	63	*Eucinostomus jonesi*	19	0	0	0	0	0	0	19
N	3m	50	73	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	50	73	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	3m	50	73	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	50	73	*Lutjanus apodus*	0	0	0	9	0	0	0	9
N	3m	50	73	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	3m	50	73	*Lutjanus griseus*	0	0	0	4	2	2	0	8
N	3m	50	73	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	50	73	*Stegastes leucostictus*	2	0	0	0	0	0	0	2
N	3m	50	90	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	50	90	*Haemulon sciurus*	0	0	0	2	1	0	0	3
N	3m	50	90	*Lutjanus apodus*	0	0	0	14	2	0	0	16
N	3m	50	90	*Lutjanus griseus*	0	0	0	5	6	0	0	11
N	3m	50	90	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	50	90	*Scarus guacamaia*	0	0	0	1	4	2	0	7
N	3m	51	30	*Lutjanus apodus*	0	0	0	4	0	0	0	4
N	3m	51	30	*Lutjanus griseus*	0	0	0	4	7	0	0	11
N	3m	51	51	*Lutjanus apodus*	0	0	0	6	0	0	0	6
N	3m	51	51	*Lutjanus griseus*	0	0	0	4	0	0	0	4
N	3m	51	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	51	63	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	51	63	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	51	63	*Lutjanus apodus*	0	0	0	3	0	0	0	3
N	3m	51	63	*Lutjanus griseus*	0	0	0	0	7	0	0	7
N	3m	51	73	*Lutjanus apodus*	0	0	0	9	0	0	0	9
N	3m	51	73	*Lutjanus griseus*	0	0	0	6	6	0	0	12
N	3m	52	0	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	52	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	52	30	*Lutjanus griseus*	0	0	0	8	0	0	0	8
N	3m	52	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	52	51	*Lutjanus apodus*	0	0	0	5	0	0	0	5
N	3m	52	51	*Sparisoma radians*	0	0	2	1	0	0	0	3
N	3m	52	63	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	52	63	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	52	63	*Lutjanus apodus*	0	0	0	3	5	0	0	8
N	3m	52	63	*Lutjanus griseus*	0	0	0	9	1	1	0	11
N	3m	52	63	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	3m	52	73	*Lutjanus apodus*	0	0	0	8	0	0	0	8
N	3m	52	90	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	52	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	53	30	*Lutjanus apodus*	0	0	0	8	0	0	0	8
N	3m	53	30	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	53	51	*Lutjanus apodus*	0	0	0	2	5	0	0	7
N	3m	53	51	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	53	63	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	53	63	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	53	63	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	53	63	*Lutjanus apodus*	0	0	0	10	6	0	0	16
N	3m	53	63	*Lutjanus griseus*	0	0	0	4	12	1	0	17
N	3m	53	63	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	3m	53	73	*Lutjanus apodus*	0	0	0	4	0	0	0	4
N	3m	53	73	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	53	90	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	3m	53	90	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	3m	54	30	*Lutjanus apodus*	0	0	0	14	2	0	0	16
N	3m	54	30	*Lutjanus griseus*	0	0	0	6	4	0	0	10
N	3m	54	30	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	54	30	*Sparisoma radians*	0	2	2	0	0	0	0	4
N	3m	54	51	*Lutjanus apodus*	0	0	0	6	2	0	0	8
N	3m	54	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	54	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	54	63	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	54	63	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	54	63	*Lutjanus apodus*	0	0	0	10	3	0	0	13
N	3m	54	63	*Lutjanus griseus*	0	0	0	5	10	0	0	15

N	3m	54	73	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	54	73	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	54	90	*Lutjanus apodus*	0	0	0	3	0	0	0	3
N	3m	54	90	*Lutjanus griseus*	0	0	0	2	0	0	0	2
N	3m	55	0	*Lutjanus griseus*	0	0	0	0	3	0	0	3
N	3m	55	30	*Lutjanus apodus*	0	0	0	12	0	0	0	12
N	3m	55	30	*Lutjanus griseus*	0	0	0	11	0	0	0	11
N	3m	55	30	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	55	30	*Sparisoma radians*	0	1	1	0	0	0	0	2
N	3m	55	51	*Lutjanus apodus*	0	0	0	3	4	0	0	7
N	3m	55	51	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	55	63	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	55	63	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	55	63	*Lutjanus apodus*	0	0	0	11	7	0	0	18
N	3m	55	63	*Lutjanus griseus*	0	0	0	6	8	0	0	14
N	3m	55	73	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	3m	55	90	*Lutjanus apodus*	0	0	0	0	2	0	0	2
N	3m	55	90	*Lutjanus griseus*	0	0	0	0	2	2	0	4
N	3m	56	30	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	3m	56	30	*Lutjanus apodus*	0	0	0	8	1	0	0	9
N	3m	56	30	*Lutjanus griseus*	0	0	0	8	1	0	0	9
N	3m	56	51	*Lutjanus apodus*	0	0	0	6	0	0	0	6
N	3m	56	51	*Lutjanus griseus*	0	0	0	0	0	1	0	1
N	3m	56	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	3m	56	63	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	3m	56	63	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	3m	56	63	*Lutjanus apodus*	0	0	0	11	5	0	0	16
N	3m	56	63	*Lutjanus griseus*	0	0	0	7	5	0	0	12
N	3m	56	73	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	56	90	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	56	90	*Lutjanus apodus*	0	0	0	2	1	0	0	3
N	3m	56	90	*Lutjanus griseus*	0	0	0	0	2	1	0	3
N	3m	56	90	*Scarus guacamaia*	0	0	0	2	1	0	0	3
N	3m	57	0	*Lutjanus apodus*	0	0	0	0	1	0	0	1
N	3m	57	0	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	57	30	*Gerres cinereus*	0	0	1	2	0	0	0	3
N	3m	57	30	*Lutjanus apodus*	0	0	0	7	1	0	0	8
N	3m	57	30	*Lutjanus griseus*	0	0	0	6	1	0	0	7
N	3m	57	51	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	57	51	*Lutjanus apodus*	0	0	0	0	6	0	0	6
N	3m	57	51	*Lutjanus griseus*	0	0	0	0	1	1	0	2
N	3m	57	51	*Sparisoma radians*	0	0	4	0	0	0	0	4
N	3m	57	63	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	57	63	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	3m	57	63	*Lutjanus apodus*	0	0	0	10	7	0	0	17
N	3m	57	63	*Lutjanus griseus*	0	0	0	14	4	0	0	18
N	3m	57	63	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	3m	57	73	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	57	90	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	3m	57	90	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	57	90	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	58	30	*Gerres cinereus*	0	0	0	2	0	0	0	2
N	3m	58	30	*Lutjanus apodus*	0	0	0	7	5	0	0	12
N	3m	58	30	*Lutjanus griseus*	0	0	0	5	8	0	0	13
N	3m	58	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	58	63	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	58	63	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	3m	58	63	*Lutjanus apodus*	0	0	0	10	9	0	0	19
N	3m	58	63	*Lutjanus griseus*	0	0	0	8	4	0	0	12
N	3m	58	63	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	3m	58	73	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	58	73	*Lutjanus griseus*	0	0	0	2	0	0	0	2
N	3m	59	0	*Lutjanus griseus*	0	0	0	2	1	0	0	3
N	3m	59	30	*Gerres cinereus*	0	0	1	1	0	0	0	2
N	3m	59	30	*Lutjanus apodus*	0	0	0	6	0	0	0	6
N	3m	59	30	*Lutjanus griseus*	0	0	0	3	0	0	0	3
N	3m	59	51	*Lutjanus apodus*	0	0	0	14	2	0	0	16
N	3m	59	51	*Lutjanus griseus*	0	0	0	8	2	0	0	10
N	3m	59	63	*Lutjanus apodus*	0	0	0	4	0	0	0	4

N	3m	59	63	*Lutjanus griseus*	0	0	0	0	1	1	0	2
N	3m	59	73	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
N	3m	59	90	*Lutjanus apodus*	0	0	0	9	2	0	0	11
N	3m	59	90	*Lutjanus griseus*	0	0	0	0	4	0	0	4
N	3m	60	0	*Lutjanus griseus*	0	0	0	0	4	0	0	4
N	3m	60	30	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	3m	60	30	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	60	51	*Lutjanus apodus*	0	0	0	0	8	0	0	8
N	3m	60	51	*Lutjanus griseus*	0	0	0	0	4	0	0	4
N	3m	60	63	*Lutjanus griseus*	0	0	0	0	4	1	0	5
N	3m	60	73	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	3m	60	90	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	61	51	*Epinephelus striatus*	0	0	0	1	0	0	0	1
N	1m	61	51	*Gerres cinereus*	0	0	6	0	0	0	0	6
N	1m	61	51	*Haemulon sciurus*	0	0	15	0	0	0	0	15
N	1m	61	51	*Lutjanus apodus*	0	0	0	0	1	0	0	1
N	1m	61	51	*Lutjanus griseus*	0	0	4	8	0	0	0	12
N	1m	61	51	*Scarus guacamaia*	0	0	0	2	0	0	0	2
N	1m	61	63	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	1m	61	63	*Haemulon sciurus*	0	0	15	0	0	0	0	15
N	1m	61	63	*Lutjanus apodus*	0	0	10	10	0	0	0	20
N	1m	61	63	*Lutjanus griseus*	0	0	5	20	1	0	0	26
N	1m	61	63	*Scarus guacamaia*	0	0	0	2	0	0	0	2
N	1m	61	90	*Gerres cinereus*	0	0	0	2	0	0	0	2
N	1m	61	90	*Lutjanus apodus*	0	0	0	18	0	0	0	18
N	1m	61	90	*Lutjanus griseus*	0	0	4	6	0	0	0	10
N	1m	61	90	*Pseudupeneus maculatus*	0	0	0	1	0	0	0	1
N	1m	62	0	*Gerres cinereus*	0	0	3	0	0	0	0	3
N	1m	62	0	*Haemulon sciurus*	0	1	0	0	0	0	0	1
N	1m	62	0	*Lutjanus apodus*	0	0	1	0	0	0	0	1
N	1m	62	0	*Sparisoma radians*	0	1	0	0	0	0	0	1
N	1m	62	30	*Haemulon sciurus*	0	0	9	0	0	0	0	9
N	1m	62	30	*Lutjanus apodus*	0	0	1	0	0	0	0	1
N	1m	62	51	*Gerres cinereus*	0	0	1	1	0	0	0	2
N	1m	62	51	*Haemulon sciurus*	0	0	24	1	0	0	0	25
N	1m	62	51	*Lutjanus apodus*	0	0	1	0	0	0	0	1
N	1m	62	51	*Lutjanus griseus*	0	0	4	0	0	1	0	5
N	1m	62	63	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	62	63	*Gerres cinereus*	0	0	1	1	0	0	0	2
N	1m	62	63	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	62	63	*Lutjanus apodus*	0	0	12	5	0	0	0	17
N	1m	62	63	*Lutjanus griseus*	0	0	14	6	2	0	0	22
N	1m	62	63	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	1m	62	63	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	1m	62	73	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
N	1m	62	90	*Haemulon sciurus*	0	0	8	0	0	0	0	8
N	1m	62	90	*Lutjanus apodus*	0	0	30	15	0	0	0	45
N	1m	62	90	*Lutjanus griseus*	0	0	15	10	0	0	0	25
N	1m	63	0	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	1m	63	0	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	1m	63	0	*Lutjanus apodus*	0	0	1	0	0	0	0	1
N	1m	63	30	*Gerres cinereus*	0	0	1	1	0	0	0	2
N	1m	63	30	*Haemulon sciurus*	0	0	3	0	0	0	0	3
N	1m	63	30	*Scarus guacamaia*	0	0	0	2	0	0	0	2
N	1m	63	51	*Haemulon sciurus*	0	0	12	2	0	0	0	14
N	1m	63	51	*Lutjanus apodus*	0	0	28	2	0	0	0	30
N	1m	63	51	*Lutjanus griseus*	0	0	10	5	0	0	0	15
N	1m	63	51	*Scarus guacamaia*	0	0	0	2	0	0	0	2
N	1m	63	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	63	51	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
N	1m	63	63	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	63	63	*Haemulon sciurus*	0	0	18	11	0	0	0	29
N	1m	63	63	*Lutjanus apodus*	0	0	16	8	1	0	0	25
N	1m	63	63	*Lutjanus griseus*	0	0	0	11	6	1	0	18
N	1m	63	63	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	1m	63	63	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	1m	63	73	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
N	1m	63	90	*Haemulon sciurus*	0	0	3	0	0	0	0	3

N	1m	63	90	*Lutjanus apodus*	0	0	25	6	0	0	0	31
N	1m	63	90	*Lutjanus griseus*	0	0	4	8	0	0	0	12
N	1m	64	0	*Lutjanus apodus*	0	0	1	2	0	0	0	3
N	1m	64	0	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
N	1m	64	30	*Haemulon sciurus*	0	0	13	0	0	0	0	13
N	1m	64	30	*Lutjanus apodus*	0	0	9	0	0	0	0	9
N	1m	64	30	*Lutjanus griseus*	0	0	5	0	0	0	0	5
N	1m	64	51	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	1m	64	51	*Haemulon sciurus*	0	0	9	0	0	0	0	9
N	1m	64	51	*Lutjanus apodus*	0	0	18	0	0	0	0	18
N	1m	64	51	*Lutjanus cyanopterus*	0	0	0	1	0	0	0	1
N	1m	64	51	*Lutjanus griseus*	0	0	3	3	1	0	0	7
N	1m	64	51	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	1m	64	51	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	1m	64	63	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	64	63	*Haemulon sciurus*	0	0	12	5	0	0	0	17
N	1m	64	63	*Lutjanus apodus*	0	0	45	14	0	0	0	59
N	1m	64	63	*Lutjanus griseus*	0	0	7	8	1	0	0	16
N	1m	64	63	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	1m	64	63	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	64	73	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	64	73	*Haemulon sciurus*	0	1	0	0	0	0	0	1
N	1m	64	73	*Lutjanus apodus*	0	0	0	2	0	0	0	2
N	1m	64	90	*Lutjanus apodus*	0	0	3	0	0	0	0	3
N	1m	65	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	65	0	*Lutjanus apodus*	0	0	2	0	0	0	0	2
N	1m	65	0	*Lutjanus griseus*	0	0	2	0	0	0	0	2
N	1m	65	30	*Haemulon sciurus*	0	4	8	0	0	0	0	12
N	1m	65	30	*Lutjanus apodus*	0	0	31	0	3	0	0	34
N	1m	65	30	*Lutjanus griseus*	0	0	9	0	0	0	0	9
N	1m	65	51	*Haemulon sciurus*	0	0	6	1	0	0	0	7
N	1m	65	51	*Lutjanus apodus*	0	0	8	0	0	0	0	8
N	1m	65	51	*Lutjanus griseus*	0	0	8	0	0	0	0	8
N	1m	65	63	*Lutjanus apodus*	0	0	42	3	0	0	0	45
N	1m	65	63	*Lutjanus cyanopterus*	0	0	0	1	0	0	0	1
N	1m	65	63	*Lutjanus griseus*	0	0	12	2	1	0	0	15
N	1m	65	73	*Haemulon sciurus*	0	3	8	0	0	0	0	11
N	1m	65	73	*Lutjanus apodus*	0	0	6	20	0	0	0	26
N	1m	65	73	*Lutjanus griseus*	0	0	0	12	1	2	0	15
N	1m	65	73	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
N	1m	65	73	*Sparisoma radians*	0	1	0	0	0	0	0	1
N	1m	65	90	*Lutjanus apodus*	0	0	7	0	0	0	0	7
N	1m	65	90	*Lutjanus griseus*	0	0	3	0	0	0	0	3
N	1m	65	90	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	1m	66	30	*Haemulon sciurus*	0	0	6	0	0	0	0	6
N	1m	66	30	*Lutjanus apodus*	0	0	26	0	0	0	0	26
N	1m	66	30	*Lutjanus griseus*	0	0	3	0	0	0	0	3
N	1m	66	51	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	1m	66	51	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	66	51	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	66	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	66	63	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
N	1m	66	63	*Haemulon sciurus*	0	0	8	0	0	0	0	8
N	1m	66	63	*Lutjanus apodus*	0	0	49	11	0	0	0	60
N	1m	66	63	*Lutjanus cyanopterus*	0	0	0	1	0	0	0	1
N	1m	66	63	*Lutjanus griseus*	0	0	12	3	0	0	0	15
N	1m	66	63	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	1m	66	73	*Lutjanus apodus*	0	3	5	0	0	0	0	8
N	1m	66	73	*Lutjanus griseus*	0	0	13	0	0	0	0	13
N	1m	66	90	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	66	90	*Lutjanus apodus*	0	0	5	0	0	0	0	5
N	1m	66	90	*Lutjanus griseus*	0	0	3	1	0	0	0	4
N	1m	66	90	*Scarus guacamaia*	0	0	0	2	0	0	0	2
N	1m	66	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	67	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	67	0	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	67	30	*Lutjanus apodus*	0	2	18	0	0	0	0	20
N	1m	67	30	*Lutjanus griseus*	0	0	4	5	0	0	0	9
N	1m	67	51	*Lutjanus apodus*	0	0	5	0	0	0	0	5

N	1m	67	63	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	1m	67	63	*Lutjanus apodus*	0	0	20	0	0	0	0	20
N	1m	67	63	*Lutjanus cyanopterus*	0	0	0	1	0	0	0	1
N	1m	67	63	*Lutjanus griseus*	0	0	7	2	2	0	0	11
N	1m	67	63	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	67	73	*Lutjanus apodus*	0	0	3	0	0	0	0	3
N	1m	67	73	*Lutjanus griseus*	0	0	1	0	0	0	0	1
N	1m	67	90	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	1m	67	90	*Lutjanus apodus*	0	0	3	3	0	0	0	6
N	1m	67	90	*Lutjanus griseus*	0	0	1	1	1	0	0	3
N	1m	67	90	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	68	30	*Gerres cinereus*	0	0	5	1	0	0	0	6
N	1m	68	30	*Lutjanus apodus*	0	0	19	0	0	0	0	19
N	1m	68	30	*Lutjanus griseus*	0	0	6	2	0	2	0	10
N	1m	68	51	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	68	51	*Lutjanus griseus*	0	0	1	0	0	0	0	1
N	1m	68	63	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	68	63	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
N	1m	68	63	*Lutjanus apodus*	0	0	12	4	0	0	0	16
N	1m	68	63	*Lutjanus griseus*	0	0	15	11	2	0	0	28
N	1m	68	73	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	68	73	*Lutjanus griseus*	0	0	2	0	0	0	0	2
N	1m	68	90	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	69	0	*Lutjanus apodus*	0	0	1	1	0	0	0	2
N	1m	69	0	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	69	30	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	69	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	69	30	*Lutjanus apodus*	0	0	18	0	0	0	0	18
N	1m	69	30	*Lutjanus griseus*	0	1	7	0	1	0	0	9
N	1m	69	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	69	51	*Lutjanus apodus*	0	0	1	3	0	0	0	4
N	1m	69	51	*Lutjanus griseus*	0	0	0	1	1	0	0	2
N	1m	69	63	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	69	63	*Haemulon sciurus*	0	0	0	0	1	0	0	1
N	1m	69	63	*Lutjanus apodus*	0	2	12	3	4	0	0	21
N	1m	69	63	*Lutjanus cyanopterus*	0	0	0	1	0	0	0	1
N	1m	69	63	*Lutjanus griseus*	0	0	0	11	6	0	0	17
N	1m	69	63	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	1m	69	73	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	69	73	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	69	73	*Lutjanus griseus*	0	0	1	0	0	0	0	1
N	1m	69	90	*Gerres cinereus*	0	5	1	0	0	0	0	6
N	1m	70	0	*Lutjanus apodus*	0	0	1	0	0	0	0	1
N	1m	70	30	*Lutjanus apodus*	0	0	18	3	0	0	0	21
N	1m	70	30	*Lutjanus griseus*	0	0	0	3	0	0	0	3
N	1m	70	51	*Lutjanus apodus*	0	0	19	0	0	0	0	19
N	1m	70	51	*Lutjanus griseus*	0	0	3	0	0	0	0	3
N	1m	70	63	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	70	63	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	70	63	*Lutjanus apodus*	0	0	11	2	1	0	0	14
N	1m	70	63	*Lutjanus griseus*	0	0	8	2	1	1	0	12
N	1m	70	63	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	1m	70	73	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	70	73	*Lutjanus apodus*	0	0	4	0	0	0	0	4
N	1m	71	0	*Sphyraena barracuda*	0	0	1	0	0	0	0	1
N	1m	71	30	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
N	1m	71	51	*Gerres cinereus*	0	0	0	4	0	0	0	4
N	1m	71	51	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	71	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	71	63	*Scarus guacamaia*	0	0	0	0	2	0	0	2
N	1m	71	63	*Sphyraena barracuda*	0	0	0	1	0	0	0	1
N	1m	71	73	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	1m	71	73	*Lutjanus analis*	0	0	0	0	1	0	0	1
N	1m	71	73	*Lutjanus apodus*	0	0	0	5	0	0	0	5
N	1m	71	73	*Lutjanus griseus*	0	0	0	3	5	0	0	8
N	1m	71	73	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	1m	71	90	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
N	1m	71	90	*Lutjanus apodus*	0	0	0	18	0	0	0	18
N	1m	71	90	*Lutjanus griseus*	0	0	0	5	2	1	0	8

N	1m	71	90	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
N	1m	72	0	*Lutjanus apodus*	0	0	2	0	0	0	0	2
N	1m	72	0	*Scarus guacamaia*	0	0	0	0	5	0	0	5
N	1m	72	30	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	1m	72	30	*Sphyraena barracuda*	0	1	0	0	0	0	0	1
N	1m	72	51	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	72	51	*Haemulon sciurus*	0	0	0	15	0	0	0	15
N	1m	72	51	*Lutjanus apodus*	0	0	43	0	0	0	0	43
N	1m	72	51	*Scarus guacamaia*	0	0	0	0	2	0	0	2
N	1m	72	63	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	72	63	*Lutjanus apodus*	0	0	16	4	0	0	0	20
N	1m	72	63	*Lutjanus griseus*	0	0	0	6	1	0	0	7
N	1m	72	63	*Sphoeroides testudineus*	0	0	0	0	5	0	0	5
N	1m	72	73	*Haemulon sciurus*	0	0	0	6	2	0	0	8
N	1m	72	73	*Lutjanus apodus*	0	0	34	4	0	0	0	38
N	1m	72	73	*Lutjanus griseus*	0	0	7	4	0	0	0	11
N	1m	72	90	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	1m	72	90	*Lutjanus apodus*	0	0	15	0	0	0	0	15
N	1m	72	90	*Lutjanus griseus*	0	0	3	0	0	0	0	3
N	1m	72	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	73	0	*Lutjanus apodus*	0	0	4	0	0	0	0	4
N	1m	73	0	*Scarus guacamaia*	0	0	0	0	5	0	0	5
N	1m	73	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	73	30	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	1m	73	51	*Gerres cinereus*	0	0	5	0	0	0	0	5
N	1m	73	51	*Haemulon sciurus*	0	0	8	2	0	0	0	10
N	1m	73	51	*Lutjanus apodus*	0	0	34	14	0	0	0	48
N	1m	73	51	*Lutjanus griseus*	0	0	0	7	0	0	0	7
N	1m	73	51	*Sphoeroides testudineus*	0	0	0	0	3	0	0	3
N	1m	73	63	*Haemulon flavolineatum*	0	0	1	0	0	0	0	1
N	1m	73	63	*Lutjanus apodus*	0	4	25	0	0	0	0	29
N	1m	73	63	*Lutjanus griseus*	0	0	4	0	0	0	0	4
N	1m	73	63	*Sphoeroides testudineus*	0	0	0	0	4	0	0	4
N	1m	73	73	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	73	73	*Haemulon sciurus*	0	0	8	4	1	0	0	13
N	1m	73	73	*Lutjanus apodus*	0	0	30	28	2	0	0	60
N	1m	73	73	*Lutjanus griseus*	0	0	3	12	0	0	0	15
N	1m	73	73	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	73	90	*Haemulon sciurus*	0	0	2	3	1	0	0	6
N	1m	73	90	*Lutjanus apodus*	0	0	19	0	0	0	0	19
N	1m	73	90	*Lutjanus griseus*	0	0	3	0	0	0	0	3
N	1m	73	90	*Sparisoma radians*	0	0	0	1	0	0	0	1
N	1m	74	0	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	74	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	74	0	*Scarus guacamaia*	0	0	0	0	3	0	0	3
N	1m	74	0	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	1m	74	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	74	30	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	1m	74	30	*Sphyraena barracuda*	0	1	0	0	0	0	0	1
N	1m	74	51	*Haemulon flavolineatum*	0	0	1	0	0	0	0	1
N	1m	74	51	*Haemulon sciurus*	0	0	12	0	0	0	0	12
N	1m	74	51	*Lutjanus apodus*	0	0	30	10	0	0	0	40
N	1m	74	51	*Lutjanus griseus*	0	0	6	8	0	0	0	14
N	1m	74	51	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	1m	74	63	*Gerres cinereus*	0	0	5	0	0	0	0	5
N	1m	74	63	*Haemulon flavolineatum*	0	0	2	0	0	0	0	2
N	1m	74	63	*Lutjanus apodus*	0	0	20	0	0	0	0	20
N	1m	74	63	*Lutjanus griseus*	0	0	2	0	0	0	0	2
N	1m	74	63	*Sphoeroides testudineus*	0	0	0	0	4	0	0	4
N	1m	74	63	*Sphyraena barracuda*	0	1	0	0	0	0	0	1
N	1m	74	73	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	74	73	*Haemulon sciurus*	0	0	9	0	0	0	0	9
N	1m	74	73	*Lutjanus apodus*	0	0	0	43	9	0	0	52
N	1m	74	73	*Lutjanus griseus*	0	0	8	12	5	0	0	25
N	1m	74	90	*Haemulon sciurus*	0	0	3	4	0	0	0	7
N	1m	74	90	*Lutjanus apodus*	0	0	10	9	0	0	0	19
N	1m	74	90	*Scarus guacamaia*	0	0	0	0	3	0	0	3
N	1m	74	90	*Sparisoma radians*	0	0	0	1	0	0	0	1
N	1m	75	0	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1

N	1m	75	0	*Scarus guacamaia*	0	0	0	0	4	0	0	4
N	1m	75	30	*Sphyraena barracuda*	0	0	0	0	0	1	0	1
N	1m	75	51	*Gerres cinereus*	0	0	4	0	0	0	0	4
N	1m	75	51	*Haemulon sciurus*	0	0	6	0	0	0	0	6
N	1m	75	51	*Lutjanus apodus*	0	0	45	15	0	0	0	60
N	1m	75	51	*Lutjanus griseus*	0	0	8	0	0	0	0	8
N	1m	75	51	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	75	63	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
N	1m	75	63	*Gerres cinereus*	0	0	5	0	0	0	0	5
N	1m	75	63	*Lutjanus apodus*	0	0	15	5	0	0	0	20
N	1m	75	63	*Lutjanus griseus*	0	0	0	4	0	0	0	4
N	1m	75	63	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	75	63	*Sphoeroides testudineus*	0	0	0	0	4	0	0	4
N	1m	75	73	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
N	1m	75	73	*Lutjanus apodus*	0	0	20	30	0	0	0	50
N	1m	75	90	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	75	90	*Gerres cinereus*	0	2	0	0	0	0	0	2
N	1m	75	90	*Haemulon sciurus*	0	0	13	5	1	0	0	19
N	1m	75	90	*Lutjanus apodus*	0	0	8	18	0	0	0	26
N	1m	75	90	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	1m	75	90	*Lutjanus griseus*	0	0	5	8	0	1	0	14
N	1m	75	90	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	75	90	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	1m	76	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	76	0	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	76	0	*Lutjanus griseus*	0	0	0	0	0	1	0	1
N	1m	76	0	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	76	51	*Haemulon sciurus*	0	0	5	0	0	0	0	5
N	1m	76	51	*Lutjanus apodus*	0	0	40	8	0	0	0	48
N	1m	76	51	*Lutjanus griseus*	0	0	5	0	0	0	0	5
N	1m	76	63	*Gerres cinereus*	0	0	3	0	0	0	0	3
N	1m	76	63	*Lutjanus apodus*	0	0	3	0	0	0	0	3
N	1m	76	63	*Sphoeroides testudineus*	0	0	0	0	5	0	0	5
N	1m	76	73	*Lutjanus apodus*	0	0	34	12	0	0	0	46
N	1m	76	73	*Lutjanus griseus*	0	0	0	8	2	0	0	10
N	1m	76	73	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	76	90	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
N	1m	76	90	*Lutjanus apodus*	0	0	3	16	9	0	0	28
N	1m	76	90	*Lutjanus griseus*	0	0	0	6	2	1	0	9
N	1m	76	90	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	1m	77	0	*Lutjanus apodus*	0	0	0	5	2	0	0	7
N	1m	77	0	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	1m	77	30	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	77	30	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
N	1m	77	30	*Scarus guacamaia*	0	0	0	0	8	0	0	8
N	1m	77	51	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	77	51	*Lutjanus apodus*	0	0	33	4	0	0	0	37
N	1m	77	51	*Lutjanus griseus*	0	0	4	0	0	0	0	4
N	1m	77	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	77	63	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	1m	77	63	*Sphoeroides testudineus*	0	0	0	0	2	0	0	2
N	1m	77	73	*Haemulon sciurus*	0	0	0	2	1	0	0	3
N	1m	77	73	*Lutjanus apodus*	0	0	12	18	0	0	0	30
N	1m	77	73	*Lutjanus griseus*	0	0	4	13	0	0	0	17
N	1m	77	73	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	77	90	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	1m	77	90	*Lutjanus apodus*	0	0	0	20	0	0	0	20
N	1m	77	90	*Lutjanus griseus*	0	0	0	12	0	2	0	14
N	1m	77	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	78	0	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	78	0	*Lutjanus apodus*	0	0	3	0	0	0	0	3
N	1m	78	0	*Scarus guacamaia*	0	0	0	0	3	0	0	3
N	1m	78	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	78	51	*Gerres cinereus*	0	0	3	0	0	0	0	3
N	1m	78	51	*Lutjanus apodus*	0	0	25	3	0	0	0	28
N	1m	78	51	*Lutjanus griseus*	0	0	2	0	0	0	0	2
N	1m	78	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	78	63	*Lutjanus griseus*	0	0	1	0	0	0	0	1
N	1m	78	63	*Sphoeroides testudineus*	0	0	0	1	0	0	0	1

N	1m	78	73	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	1m	78	73	*Lutjanus apodus*	0	0	14	15	0	0	0	29
N	1m	78	73	*Lutjanus griseus*	0	0	4	9	0	0	0	13
N	1m	78	90	*Lutjanus apodus*	0	0	16	30	0	0	0	46
N	1m	78	90	*Lutjanus griseus*	0	0	0	0	12	2	0	14
N	1m	79	0	*Scarus guacamaia*	0	0	0	0	5	0	0	5
N	1m	79	0	*Sphyraena barracuda*	0	0	0	1	0	0	0	1
N	1m	79	51	*Gerres cinereus*	0	1	0	1	0	0	0	2
N	1m	79	51	*Lutjanus apodus*	0	0	14	0	0	0	0	14
N	1m	79	51	*Lutjanus griseus*	0	0	1	0	0	0	0	1
N	1m	79	63	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	79	63	*Sphyraena barracuda*	0	0	0	1	0	0	0	1
N	1m	79	73	*Haemulon sciurus*	0	0	2	0	0	0	0	2
N	1m	79	73	*Lutjanus apodus*	0	0	15	0	0	0	0	15
N	1m	79	73	*Lutjanus griseus*	0	0	0	5	3	0	0	8
N	1m	79	73	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	1m	79	90	*Lutjanus apodus*	0	0	2	12	3	1	0	18
N	1m	79	90	*Lutjanus griseus*	0	0	0	0	2	1	0	3
N	1m	79	90	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	80	0	*Sphyraena barracuda*	0	0	1	0	0	0	0	1
N	1m	80	30	*Scarus guacamaia*	0	0	0	0	3	0	0	3
N	1m	80	30	*Sphoeroides testudineus*	0	0	0	1	0	0	0	1
N	1m	80	51	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	80	51	*Gerres cinereus*	0	0	0	3	0	0	0	3
N	1m	80	51	*Lutjanus apodus*	0	0	7	4	0	0	0	11
N	1m	80	51	*Lutjanus griseus*	0	0	1	0	0	0	0	1
N	1m	80	51	*Scarus guacamaia*	0	0	0	1	4	0	0	5
N	1m	80	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	80	63	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	1m	80	63	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	80	63	*Sphoeroides testudineus*	0	0	0	1	0	0	0	1
N	1m	80	73	*Caranx ruber*	0	1	0	0	0	0	0	1
N	1m	80	73	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	80	73	*Lutjanus apodus*	0	0	0	6	0	0	0	6
N	1m	80	73	*Lutjanus griseus*	0	0	0	9	2	0	0	11
N	1m	80	73	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	1m	80	73	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
N	1m	80	90	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	80	90	*Lutjanus apodus*	0	0	0	18	2	0	0	20
N	1m	80	90	*Lutjanus griseus*	0	0	0	4	1	0	0	5
N	1m	81	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	81	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	81	30	*Lutjanus griseus*	0	0	0	2	0	0	0	2
N	1m	81	51	*Lutjanus apodus*	0	0	0	12	2	0	0	14
N	1m	81	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	81	63	*Scarus guacamaia*	0	0	0	0	2	0	0	2
N	1m	81	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	81	90	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	1m	81	90	*Lutjanus griseus*	0	0	0	13	0	0	0	13
N	1m	82	0	*Lutjanus griseus*	0	0	1	0	0	0	0	1
N	1m	82	0	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	82	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	82	30	*Lutjanus apodus*	0	0	18	0	0	0	0	18
N	1m	82	30	*Lutjanus griseus*	0	0	6	1	2	0	0	9
N	1m	82	51	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	82	51	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	82	51	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	1m	82	63	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	82	73	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	82	73	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	82	73	*Scarus guacamaia*	0	0	0	0	2	0	0	2
N	1m	82	90	*Lutjanus apodus*	0	0	20	3	0	0	0	23
N	1m	82	90	*Lutjanus griseus*	0	0	4	3	0	0	0	7
N	1m	83	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	83	30	*Gerres cinereus*	0	0	0	0	1	0	0	1
N	1m	83	30	*Lutjanus apodus*	0	0	0	11	0	0	0	11
N	1m	83	30	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	1m	83	30	*Lutjanus griseus*	0	0	0	2	5	0	0	7
N	1m	83	51	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1

N	1m	83	51	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	83	51	*Lutjanus apodus*	0	0	0	0	1	0	0	1
N	1m	83	51	*Sparisoma radians*	0	0	0	1	0	0	0	1
N	1m	83	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	83	63	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	83	73	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	83	73	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	83	90	*Lutjanus apodus*	0	0	0	35	0	0	0	35
N	1m	83	90	*Lutjanus griseus*	0	0	0	13	0	0	0	13
N	1m	84	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	84	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	84	30	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	84	30	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	84	30	*Haemulon sciurus*	0	0	3	0	0	0	0	3
N	1m	84	30	*Lutjanus apodus*	0	0	0	15	0	0	0	15
N	1m	84	30	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	1m	84	30	*Lutjanus griseus*	0	0	0	8	1	1	0	10
N	1m	84	51	*Lutjanus apodus*	0	0	1	0	0	0	0	1
N	1m	84	63	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	84	63	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	84	73	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	84	73	*Lutjanus apodus*	0	0	0	6	4	0	0	10
N	1m	84	73	*Scarus guacamaia*	0	0	0	1	6	0	0	7
N	1m	84	90	*Lutjanus apodus*	0	0	0	18	2	0	0	20
N	1m	84	90	*Lutjanus griseus*	0	0	0	6	4	0	0	10
N	1m	85	0	*Gerres cinereus*	0	0	4	0	0	0	0	4
N	1m	85	30	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	85	30	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	1m	85	30	*Lutjanus griseus*	0	0	0	5	1	0	0	6
N	1m	85	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	85	73	*Gerres cinereus*	0	0	5	0	0	0	0	5
N	1m	85	90	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	85	90	*Lutjanus apodus*	0	0	0	4	0	0	0	4
N	1m	86	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	86	30	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	86	30	*Lutjanus apodus*	0	0	2	0	0	0	0	2
N	1m	86	51	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
N	1m	86	63	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	86	73	*Gerres cinereus*	0	10	0	0	0	0	0	10
N	1m	86	73	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	86	73	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
N	1m	86	90	*Lutjanus apodus*	0	0	0	7	0	0	0	7
N	1m	87	0	*Gerres cinereus*	0	4	0	0	0	0	0	4
N	1m	87	0	*Gerres cinereus*	0	4	0	0	0	0	0	4
N	1m	87	30	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	87	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	87	30	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	87	63	*Gerres cinereus*	0	0	14	0	0	0	0	14
N	1m	87	73	*Gerres cinereus*	0	3	0	0	0	0	0	3
N	1m	87	73	*Gerres cinereus*	0	0	10	0	0	0	0	10
N	1m	87	90	*Lutjanus apodus*	0	0	0	5	0	0	0	5
N	1m	88	30	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
N	1m	88	30	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	88	30	*Haemulon sciurus*	0	0	0	0	3	0	0	3
N	1m	88	30	*Lutjanus apodus*	0	0	0	8	2	0	0	10
N	1m	88	30	*Lutjanus griseus*	0	0	0	5	2	0	0	7
N	1m	88	30	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
N	1m	88	30	*Scarus guacamaia*	0	0	0	0	6	0	0	6
N	1m	88	51	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	88	51	*Lutjanus apodus*	0	0	0	15	0	0	0	15
N	1m	88	63	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	88	73	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	88	73	*Gerres cinereus*	0	0	7	9	0	0	0	16
N	1m	88	73	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	88	90	*Lutjanus apodus*	0	0	0	7	0	0	0	7
N	1m	88	90	*Lutjanus griseus*	0	0	0	2	0	0	0	2
N	1m	89	0	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
N	1m	89	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	89	30	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1

N	1m	89	30	*Lutjanus apodus*	0	0	0	10	2	2	0	14
N	1m	89	30	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	1m	89	30	*Lutjanus griseus*	0	0	0	0	8	2	0	10
N	1m	89	30	*Mulloidichthys martinicus*	0	0	0	3	0	0	0	3
N	1m	89	30	*Scarus guacamaia*	0	0	0	0	2	0	0	2
N	1m	89	51	*Gerres cinereus*	0	0	3	0	0	0	0	3
N	1m	89	51	*Lutjanus apodus*	0	0	0	13	0	0	0	13
N	1m	89	63	*Gerres cinereus*	0	0	6	0	0	0	0	6
N	1m	89	63	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	89	63	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	89	63	*Scarus guacamaia*	0	0	0	0	4	0	0	4
N	1m	89	73	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	89	73	*Gerres cinereus*	0	0	11	0	0	0	0	11
N	1m	89	90	*Haemulon sciurus*	0	0	0	12	0	0	0	12
N	1m	89	90	*Lutjanus apodus*	0	0	10	20	0	0	0	30
N	1m	89	90	*Lutjanus griseus*	0	0	6	0	0	0	0	6
N	1m	89	90	*Sparisoma radians*	0	0	0	2	0	0	0	2
N	1m	90	0	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	90	30	*Lutjanus apodus*	0	0	0	8	0	0	0	8
N	1m	90	30	*Lutjanus griseus*	0	0	0	4	0	1	0	5
N	1m	90	30	*Mulloidichthys martinicus*	0	0	0	2	0	0	0	2
N	1m	90	30	*Scarus guacamaia*	0	0	0	0	5	0	0	5
N	1m	90	51	*Acanthurus coeruleus*	0	0	1	0	0	0	0	1
N	1m	90	51	*Gerres cinereus*	0	0	5	0	0	0	0	5
N	1m	90	51	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	1m	90	51	*Lutjanus apodus*	0	0	0	8	0	0	0	8
N	1m	90	63	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	90	63	*Gerres cinereus*	0	0	6	1	0	0	0	7
N	1m	90	63	*Lutjanus apodus*	0	0	0	8	0	0	0	8
N	1m	90	73	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	1m	90	90	*Haemulon flavolineatum*	0	0	0	10	0	0	0	10
N	1m	90	90	*Haemulon sciurus*	0	0	0	13	1	0	0	14
N	1m	90	90	*Lutjanus apodus*	0	0	14	20	0	0	0	34
N	1m	90	90	*Lutjanus griseus*	0	0	0	2	6	0	0	8
N	1m	90	90	*Scarus guacamaia*	0	0	0	0	2	1	0	3
S	1m	91	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	91	63	*Scarus guacamaia*	0	0	0	3	0	0	0	3
S	1m	91	63	*Thalassoma bifasciatum*	0	1	0	0	0	0	0	1
S	1m	91	90	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	1m	91	90	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	91	90	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	91	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	92	30	*Mulloidichthys martinicus*	0	0	5	0	0	0	0	5
S	1m	92	30	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	92	51	*Gerres cinereus*	0	1	0	0	0	0	0	1
S	1m	92	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	92	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	92	73	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	92	73	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	92	90	*Mulloidichthys martinicus*	0	0	4	0	0	0	0	4
S	1m	92	90	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	92	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	92	90	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	93	0	*Lutjanus griseus*	0	3	0	0	0	0	0	3
S	1m	93	0	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	93	0	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	93	30	*Lutjanus griseus*	0	0	1	0	0	0	0	1
S	1m	93	63	*Gerres cinereus*	0	1	0	0	0	0	0	1
S	1m	93	90	*Epinephelus striatus*	0	0	0	0	1	0	0	1
S	1m	93	90	*Lutjanus apodus*	0	0	2	0	0	0	0	2
S	1m	93	90	*Lutjanus griseus*	0	0	2	0	0	0	0	2
S	1m	93	90	*Mulloidichthys martinicus*	0	0	2	0	0	0	0	2
S	1m	93	90	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	1m	94	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	94	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	94	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	94	73	*Halichoeres maculipinna*	0	1	0	0	0	0	0	1
S	1m	94	90	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	94	90	*Ocyurus chrysurus*	0	0	5	0	0	0	0	5

S	1m	94	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	95	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	95	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	95	63	*Halichoeres maculipinna*	0	1	0	0	0	0	0	1
S	1m	95	63	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	1m	95	63	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	1m	95	90	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	95	90	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	95	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	96	0	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	96	30	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	96	63	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	1m	96	73	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	1m	96	90	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	96	90	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	97	30	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	1m	97	30	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	97	63	*Kyphosus sectatrix*	0	0	0	2	0	0	0	2
S	1m	97	63	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	97	73	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	1m	97	73	*Lutjanus apodus*	0	0	0	3	0	0	0	3
S	1m	97	73	*Pomacanthus paru*	0	0	0	1	0	0	0	1
S	1m	97	73	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	97	90	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	97	90	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	1m	97	90	*Lutjanus apodus*	0	0	3	3	2	0	0	8
S	1m	97	90	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	97	90	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	97	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	98	0	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	98	0	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	98	0	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	98	30	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	1m	98	51	*Myrichthys ocellatus*	0	0	0	0	0	0	1	1
S	1m	98	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	98	63	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	98	73	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	98	73	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	98	90	*Lutjanus apodus*	0	0	1	6	2	0	0	9
S	1m	98	90	*Mulloidichthys martinicus*	0	3	1	0	0	0	0	4
S	1m	98	90	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	98	90	*Scarus croicensis*	0	5	0	0	0	0	0	5
S	1m	98	90	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	1m	99	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	99	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	99	51	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	99	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	99	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	99	63	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	1m	99	63	*Mulloidichthys martinicus*	0	4	0	0	0	0	0	4
S	1m	99	63	*Ocyurus chrysurus*	0	0	3	1	0	0	0	4
S	1m	99	73	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	99	73	*Pomacanthus paru*	0	0	1	0	0	0	0	1
S	1m	99	73	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	99	90	*Lutjanus apodus*	0	0	1	0	6	0	0	7
S	1m	99	90	*Mulloidichthys martinicus*	0	1	0	0	0	0	0	1
S	1m	99	90	*Ocyurus chrysurus*	0	3	1	0	0	0	0	4
S	1m	100	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	100	30	*Scarus guacamaia*	0	0	1	0	0	0	0	1
S	1m	100	51	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	1m	100	51	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	100	51	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	100	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	100	63	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	100	63	*Ocyurus chrysurus*	0	2	0	0	0	0	0	2
S	1m	100	63	*Sparisoma radians*	0	0	1	1	0	0	0	2
S	1m	100	73	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	100	73	*Pomacanthus paru*	0	0	0	1	0	0	0	1
S	1m	100	90	*Haemulon sciurus*	0	0	0	1	0	0	0	1

S	1m	100	90	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	1m	100	90	*Lutjanus apodus*	0	0	0	1	4	0	0	5
S	1m	101	0	*Mulloidichthys martinicus*	0	0	4	0	0	0	0	4
S	1m	101	30	*Lutjanus apodus*	0	0	0	2	8	0	0	10
S	1m	101	30	*Mulloidichthys martinicus*	0	0	0	0	1	0	0	1
S	1m	101	30	*Ocyurus chrysurus*	0	0	0	5	0	0	0	5
S	1m	101	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	1m	101	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	101	51	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	1m	101	51	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	101	63	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	101	63	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
S	1m	101	73	*Lutjanus apodus*	0	0	0	5	0	0	0	5
S	1m	101	90	*Kyphosus sectatrix*	0	0	0	1	0	0	0	1
S	1m	101	90	*Lutjanus apodus*	0	0	0	0	5	0	0	5
S	1m	101	90	*Lutjanus griseus*	0	0	0	0	5	0	0	5
S	1m	101	90	*Lutjanus mahogoni*	0	0	0	2	0	0	0	2
S	1m	101	90	*Pomacanthus paru*	0	0	0	2	0	0	0	2
S	1m	101	90	*Scarus guacamaia*	0	0	0	1	3	0	0	4
S	1m	102	0	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
S	1m	102	30	*Mulloidichthys martinicus*	0	0	0	0	2	0	0	2
S	1m	102	30	*Ocyurus chrysurus*	0	0	6	0	0	0	0	6
S	1m	102	30	*Scarus taeniopterus*	2	0	0	0	0	0	0	2
S	1m	102	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	1m	102	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	102	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	102	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	102	51	*Scarus guacamaia*	0	0	0	2	3	0	0	5
S	1m	102	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	102	73	*Lutjanus apodus*	0	0	0	3	0	0	0	3
S	1m	102	90	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	102	90	*Lutjanus apodus*	0	0	0	2	5	0	0	7
S	1m	102	90	*Lutjanus griseus*	0	0	0	0	2	0	0	2
S	1m	102	90	*Lutjanus mahogoni*	0	0	0	7	0	0	0	7
S	1m	102	90	*Pomacanthus paru*	0	0	0	2	0	0	0	2
S	1m	102	90	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	102	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	103	0	*Scarus guacamaia*	0	0	0	0	3	0	0	3
S	1m	103	30	*Haemulon sciurus*	0	0	0	0	1	0	0	1
S	1m	103	30	*Lutjanus apodus*	0	0	0	3	0	0	0	3
S	1m	103	30	*Mulloidichthys martinicus*	0	0	0	0	2	0	0	2
S	1m	103	30	*Ocyurus chrysurus*	0	0	4	0	0	0	0	4
S	1m	103	30	*Scarus croicensis*	0	2	0	0	0	0	0	2
S	1m	103	51	*Gerres cinereus*	0	0	2	0	0	0	0	2
S	1m	103	51	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	103	51	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	103	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	103	63	*Lutjanus mahogoni*	0	0	3	0	0	0	0	3
S	1m	103	73	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	103	73	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	103	73	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	103	73	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	103	90	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	103	90	*Lutjanus apodus*	0	0	0	3	5	0	0	8
S	1m	103	90	*Lutjanus mahogoni*	0	0	2	0	0	0	0	2
S	1m	103	90	*Pomacanthus paru*	0	0	0	2	0	0	0	2
S	1m	103	90	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	103	90	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	104	0	*Sphyraena barracuda*	0	0	0	0	2	0	0	2
S	1m	104	30	*Haemulon sciurus*	0	0	0	0	1	0	0	1
S	1m	104	30	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	104	30	*Ocyurus chrysurus*	0	0	3	1	0	0	0	4
S	1m	104	30	*Scarus croicensis*	0	4	0	0	0	0	0	4
S	1m	104	30	*Sparisoma radians*	0	4	1	2	0	0	0	7
S	1m	104	51	*Acanthurus bahianus*	0	1	0	0	0	0	0	1
S	1m	104	51	*Gerres cinereus*	0	1	0	0	0	0	0	1
S	1m	104	51	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	104	51	*Lutjanus mahogoni*	0	0	2	0	0	0	0	2
S	1m	104	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1

S	1m	104	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	104	51	*Scarus guacamaia*	0	0	0	2	0	0	0	2
S	1m	104	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	104	63	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	104	73	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	104	73	*Lutjanus griseus*	0	0	0	0	1	0	0	1
S	1m	104	73	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	104	73	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	104	73	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	104	90	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	1m	104	90	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	1m	104	90	*Lutjanus apodus*	0	0	0	2	6	0	0	8
S	1m	104	90	*Mulloidichthys martinicus*	0	0	4	0	0	0	0	4
S	1m	104	90	*Pomacanthus paru*	0	0	0	2	0	0	0	2
S	1m	104	90	*Scarus croicensis*	0	8	0	0	0	0	0	8
S	1m	104	90	*Scarus guacamaia*	0	0	0	0	3	0	0	3
S	1m	105	0	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
S	1m	105	30	*Scarus taeniopterus*	4	4	0	0	0	0	0	8
S	1m	105	30	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	105	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	105	51	*Gerres cinereus*	0	0	2	0	0	0	0	2
S	1m	105	51	*Lutjanus mahogoni*	0	0	2	0	0	0	0	2
S	1m	105	63	*Lutjanus apodus*	0	0	0	0	1	0	0	1
S	1m	105	63	*Mulloidichthys martinicus*	0	0	0	0	2	0	0	2
S	1m	105	63	*Scarus guacamaia*	0	0	0	0	1	0	0	1
S	1m	105	73	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	105	73	*Lutjanus apodus*	0	0	0	0	2	0	0	2
S	1m	105	73	*Lutjanus griseus*	0	0	0	0	1	0	0	1
S	1m	105	73	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
S	1m	105	73	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	105	90	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	1m	105	90	*Lutjanus apodus*	0	0	0	0	4	0	0	4
S	1m	105	90	*Lutjanus griseus*	0	0	0	0	1	0	0	1
S	1m	105	90	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	105	90	*Mulloidichthys martinicus*	0	0	3	0	0	0	0	3
S	1m	105	90	*Pomacanthus paru*	0	0	0	1	0	0	0	1
S	1m	105	90	*Scarus taeniopterus*	11	0	0	0	0	0	0	11
S	1m	105	90	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	106	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	106	30	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	1m	106	30	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	106	30	*Pseudupeneus maculatus*	0	0	1	0	0	0	0	1
S	1m	106	30	*Scarus taeniopterus*	10	0	0	0	0	0	0	10
S	1m	106	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	106	30	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	106	51	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	106	63	*Scarus guacamaia*	0	0	0	0	4	0	0	4
S	1m	106	73	*Acanthurus bahianus*	0	0	0	1	0	0	0	1
S	1m	106	73	*Lutjanus apodus*	0	0	0	0	3	0	0	3
S	1m	106	73	*Lutjanus griseus*	0	0	0	0	2	1	0	3
S	1m	106	73	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	106	73	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	106	90	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	106	90	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	1m	106	90	*Pomacanthus paru*	0	0	0	1	0	0	0	1
S	1m	107	0	*Scarus guacamaia*	0	0	0	0	1	0	0	1
S	1m	107	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	107	30	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	107	30	*Ocyurus chrysurus*	0	0	4	0	0	0	0	4
S	1m	107	30	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
S	1m	107	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	107	51	*Mulloidichthys martinicus*	0	0	0	0	2	0	0	2
S	1m	107	51	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	107	73	*Mulloidichthys martinicus*	0	0	4	0	0	0	0	4
S	1m	107	73	*Pomacanthus paru*	0	0	0	1	0	0	0	1
S	1m	107	90	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	107	90	*Kyphosus sectatrix*	0	0	0	0	1	0	0	1
S	1m	108	30	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3

S	1m	108	30	*Scarus taeniopterus*	8	0	0	0	0	0	0	8
S	1m	108	30	*Sparisoma radians*	0	6	0	0	0	0	0	6
S	1m	108	51	*Pomacanthus paru*	0	0	0	1	0	0	0	1
S	1m	108	51	*Scarus guacamaia*	0	0	0	0	5	0	0	5
S	1m	108	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	108	73	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	108	73	*Mulloidichthys martinicus*	0	0	5	0	0	0	0	5
S	1m	108	73	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	108	73	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	108	73	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
S	1m	108	90	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	108	90	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	109	0	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	109	30	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
S	1m	109	30	*Scarus taeniopterus*	11	0	0	0	0	0	0	11
S	1m	109	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	1m	109	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	109	63	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	109	73	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	109	73	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	109	90	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	110	0	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	110	30	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
S	1m	110	30	*Scarus taeniopterus*	9	0	0	0	0	0	0	9
S	1m	110	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	1m	110	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	110	63	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
S	1m	110	73	*Scarus guacamaia*	0	0	0	0	4	0	0	4
S	1m	111	0	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	111	0	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	1m	111	30	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
S	1m	111	30	*Haemulon parrai*	0	0	0	2	6	0	0	8
S	1m	111	30	*Lutjanus apodus*	0	0	0	5	0	0	0	5
S	1m	111	30	*Lutjanus griseus*	0	0	0	3	0	0	0	3
S	1m	111	30	*Lutjanus mahogoni*	0	0	2	0	0	0	0	2
S	1m	111	30	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
S	1m	111	30	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	1m	111	51	*Lutjanus apodus*	0	0	1	2	0	0	0	3
S	1m	111	51	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	111	73	*Lutjanus apodus*	0	0	0	1	3	0	0	4
S	1m	111	90	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
S	1m	111	90	*Acanthurus bahianus*	0	0	1	1	0	0	0	2
S	1m	111	90	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	1m	111	90	*Lutjanus apodus*	0	0	0	6	12	0	0	18
S	1m	111	90	*Lutjanus griseus*	0	0	0	4	4	0	0	8
S	1m	111	90	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	112	30	*Lutjanus cyanopterus*	0	0	1	0	0	0	0	1
S	1m	112	30	*Mulloidichthys martinicus*	0	0	4	0	0	0	0	4
S	1m	112	30	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	112	30	*Sparisoma radians*	0	0	5	0	0	0	0	5
S	1m	112	51	*Gobiidae*	1	0	0	0	0	0	0	1
S	1m	112	51	*Ocyurus chrysurus*	0	0	0	3	0	0	0	3
S	1m	112	63	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	112	73	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	112	90	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	1m	112	90	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	1m	113	0	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	1m	113	0	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	113	0	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	1m	113	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	113	30	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	1m	113	30	*Lutjanus mahogoni*	0	0	2	0	0	0	0	2
S	1m	113	30	*Mulloidichthys martinicus*	0	0	2	0	0	0	0	2
S	1m	113	30	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	1m	113	30	*Stegastes leucostictus*	1	0	0	0	0	0	0	1
S	1m	113	51	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	1m	113	51	*Lutjanus apodus*	0	0	2	1	0	0	0	3
S	1m	114	0	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	114	30	*Abudefduf saxatilis*	1	1	0	0	0	0	0	2

S	1m	114	30	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	1m	114	30	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	114	30	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	1m	114	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	114	51	*Haemulon flavolineatum*	0	0	1	0	0	0	0	1
S	1m	114	51	*Lutjanus apodus*	0	0	1	1	0	0	0	2
S	1m	114	51	*Mulloidichthys martinicus*	0	0	0	2	0	0	0	2
S	1m	114	51	*Ocyurus chrysurus*	0	0	2	1	0	0	0	3
S	1m	114	51	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	114	63	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	114	73	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	115	0	*Haemulon parrai*	0	0	0	2	0	0	0	2
S	1m	115	0	*Haemulon sciurus*	0	0	0	4	12	0	0	16
S	1m	115	0	*Lutjanus cyanopterus*	0	0	0	1	0	0	0	1
S	1m	115	0	*Scarus guacamaia*	0	0	0	0	3	0	0	3
S	1m	115	30	*Abudefduf saxatilis*	2	1	0	0	0	0	0	3
S	1m	115	30	*Haemulon parrai*	0	0	0	4	0	0	0	4
S	1m	115	30	*Haemulon sciurus*	0	0	4	8	3	0	0	15
S	1m	115	30	*Lutjanus cyanopterus*	0	0	2	0	0	0	0	2
S	1m	115	30	*Lutjanus griseus*	0	0	0	2	0	0	0	2
S	1m	115	30	*Mulloidichthys martinicus*	0	0	3	0	0	0	0	3
S	1m	115	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	115	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	115	51	*Gobiidae*	1	0	0	0	0	0	0	1
S	1m	115	51	*Haemulon flavolineatum*	0	0	1	0	0	0	0	1
S	1m	115	51	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	115	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	115	63	*Haemulon parrai*	0	0	0	2	0	0	0	2
S	1m	115	63	*Lutjanus apodus*	0	0	0	8	0	0	0	8
S	1m	115	73	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	115	90	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	1m	115	90	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	1m	115	90	*Kyphosus sectatrix*	0	0	0	0	1	0	0	1
S	1m	115	90	*Lutjanus apodus*	0	0	0	4	0	0	0	4
S	1m	115	90	*Lutjanus cyanopterus*	0	0	0	1	0	0	0	1
S	1m	115	90	*Lutjanus griseus*	0	0	0	3	0	0	0	3
S	1m	115	90	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	116	0	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	116	0	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	116	30	*Abudefduf saxatilis*	1	1	0	0	0	0	0	2
S	1m	116	30	*Kyphosus sectatrix*	0	0	0	0	1	0	0	1
S	1m	116	30	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	116	30	*Scarus guacamaia*	0	0	0	0	3	0	0	3
S	1m	116	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	1m	116	51	*Lutjanus apodus*	0	0	1	2	0	0	0	3
S	1m	116	51	*Lutjanus griseus*	0	0	3	0	0	0	0	3
S	1m	116	51	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	116	63	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	116	63	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	116	63	*Lutjanus griseus*	0	0	1	0	0	0	0	1
S	1m	116	63	*Sparisoma radians*	0	1	4	0	0	0	0	5
S	1m	116	73	*Acanthurus bahianus*	0	0	0	1	0	0	0	1
S	1m	116	73	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	116	90	*Lutjanus apodus*	0	0	0	3	8	0	0	11
S	1m	116	90	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	116	90	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	116	90	*Pomacanthus arcuatus*	0	0	0	1	0	0	0	1
S	1m	116	90	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	117	0	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	117	0	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	117	0	*Scarus taeniopterus*	5	0	0	0	0	0	0	5
S	1m	117	0	*Sparisoma radians*	0	3	1	0	0	0	0	4
S	1m	117	30	*Abudefduf saxatilis*	2	1	0	0	0	0	0	3
S	1m	117	30	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	117	30	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	117	30	*Scarus taeniopterus*	4	0	0	0	0	0	0	4
S	1m	117	30	*Sparisoma radians*	0	3	3	1	0	0	0	7
S	1m	117	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	117	51	*Haemulon sciurus*	0	0	0	1	0	0	0	1

S	1m	117	51	*Lutjanus apodus*	0	0	1	1	0	0	0	2
S	1m	117	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	117	51	*Ocyurus chrysurus*	0	0	4	0	0	0	0	4
S	1m	117	51	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	117	51	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	1m	117	63	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	117	63	*Sparisoma radians*	0	0	3	1	0	0	0	4
S	1m	117	90	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	117	90	*Lutjanus apodus*	0	0	0	4	0	0	0	4
S	1m	117	90	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	1m	117	90	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	117	90	*Pomacanthus arcuatus*	0	0	0	1	0	0	0	1
S	1m	117	90	*Sparisoma radians*	0	4	0	0	0	0	0	4
S	1m	118	0	*Mulloidichthys martinicus*	0	0	0	2	0	0	0	2
S	1m	118	0	*Sparisoma radians*	0	0	6	0	0	0	0	6
S	1m	118	30	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	1m	118	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	118	30	*Lutjanus mahogoni*	0	0	1	1	0	0	0	2
S	1m	118	30	*Mulloidichthys martinicus*	0	0	0	1	0	0	0	1
S	1m	118	30	*Scarus croicensis*	5	0	0	0	0	0	0	5
S	1m	118	30	*Scarus guacamaia*	0	0	0	0	1	0	0	1
S	1m	118	30	*Sparisoma radians*	0	0	6	0	0	0	0	6
S	1m	118	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	118	51	*Lutjanus apodus*	0	0	0	1	1	0	0	2
S	1m	118	51	*Mulloidichthys martinicus*	0	0	1	2	0	0	0	3
S	1m	118	51	*Ocyurus chrysurus*	0	0	5	0	0	0	0	5
S	1m	118	51	*Scarus taeniopterus*	4	0	0	0	0	0	0	4
S	1m	118	51	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	1m	118	63	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	118	63	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	118	63	*Scarus guacamaia*	0	0	0	1	1	0	0	2
S	1m	118	63	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
S	1m	118	73	*Lutjanus apodus*	0	0	0	2	1	0	0	3
S	1m	118	73	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	1m	118	90	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	118	90	*Lutjanus apodus*	0	0	0	5	10	0	0	15
S	1m	118	90	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
S	1m	118	90	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	118	90	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	119	0	*Haemulon parrai*	0	0	0	1	0	0	0	1
S	1m	119	0	*Halichoeres maculipinna*	0	1	0	0	0	0	0	1
S	1m	119	0	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
S	1m	119	0	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	119	0	*Scarus guacamaia*	0	0	0	0	1	0	0	1
S	1m	119	0	*Scarus taeniopterus*	3	0	0	0	0	0	0	3
S	1m	119	0	*Sparisoma radians*	0	0	5	0	0	0	0	5
S	1m	119	30	*Abudefduf saxatilis*	2	1	0	0	0	0	0	3
S	1m	119	30	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
S	1m	119	30	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	119	30	*Sparisoma radians*	0	5	1	0	0	0	0	6
S	1m	119	63	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	119	63	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	119	63	*Scarus guacamaia*	0	0	0	0	2	0	0	2
S	1m	119	63	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	1m	119	73	*Mulloidichthys martinicus*	0	0	2	0	0	0	0	2
S	1m	119	73	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	119	73	*Scarus guacamaia*	0	0	0	1	1	0	0	2
S	1m	119	90	*Lutjanus apodus*	0	0	0	7	8	0	0	15
S	1m	119	90	*Lutjanus griseus*	0	0	0	4	0	0	0	4
S	1m	119	90	*Pomacanthus arcuatus*	0	0	0	1	0	0	0	1
S	1m	119	90	*Scarus guacamaia*	0	0	0	1	0	0	0	1
S	1m	119	90	*Sparisoma radians*	0	0	0	1	0	0	0	1
S	1m	120	0	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
S	1m	120	0	*Sparisoma radians*	0	0	4	2	0	0	0	6
S	1m	120	30	*Abudefduf saxatilis*	2	1	0	0	0	0	0	3
S	1m	120	30	*Acanthurus bahianus*	0	1	0	0	0	0	0	1
S	1m	120	30	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
S	1m	120	30	*Mulloidichthys martinicus*	0	1	0	0	0	0	0	1
S	1m	120	30	*Scarus guacamaia*	0	0	0	0	3	0	0	3

S	1m	120	30	*Sparisoma radians*	0	0	4	1	0	0	0	5
S	1m	120	51	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	120	51	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	120	51	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	120	51	*Ocyurus chrysurus*	0	0	4	0	0	0	0	4
S	1m	120	51	*Sparisoma radians*	0	0	4	1	0	0	0	5
S	1m	120	51	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
S	1m	120	63	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	120	63	*Mulloidichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	120	63	*Sparisoma radians*	0	0	0	3	0	0	0	3
S	1m	120	90	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	120	90	*Lutjanus apodus*	0	0	0	2	9	0	0	11
S	1m	120	90	*Lutjanus griseus*	0	0	0	1	3	0	0	4
S	1m	120	90	*Pomacanthus arcuatus*	0	0	0	1	0	0	0	1
					242	249	3060	3405	1289	65	13	8323

APPENDIX V – Fish count data from Artificial Mangrove root density manipulations. Site N = North, Site S = South, Distance = distance from natural mangrove fringe, roots = root density m^{-2}.

Site	Distance	Sample	Roots	*Species*	<5cm	5-10cm	10-15cm	15-20cm	20-30cm	30-40cm	>40cm	Abund.
N	3m	1	0	*Caranx latus*	0	0	0	1	0	0	0	1
N	3m	1	0	*Lutjanus griseus*	0	0	1	0	0	0	0	1
N	3m	1	20	*Lutjanus apodus*	0	0	3	0	0	0	0	3
N	3m	1	20	*Lutjanus griseus*	0	0	0	14	0	0	0	14
N	3m	1	20	*Scarus guacamaia*	0	0	0	4	0	0	0	4
N	3m	1	20	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	3m	1	30	*Caranx latus*	0	0	0	1	0	0	0	1
N	3m	1	30	*Caranx ruber*	0	0	0	1	0	0	0	1
N	3m	1	30	*Haemulon parrai*	0	0	0	1	0	0	0	1
N	3m	1	30	*Haemulon sciurus*	0	0	6	0	0	0	0	6
N	3m	1	30	*Lutjanus apodus*	0	0	7	3	0	0	0	10
N	3m	1	30	*Lutjanus griseus*	0	0	6	12	0	0	0	18
N	3m	1	30	*Sparisoma radians*	0	0	4	0	0	0	0	4
N	3m	1	40	*Lutjanus apodus*	0	0	7	0	0	0	0	7
N	3m	1	40	*Lutjanus griseus*	0	0	4	2	0	0	0	6
N	3m	1	40	*Ocyurus chrysurus*	0	0	6	0	0	0	0	6
N	3m	1	40	*Sparisoma radians*	0	0	9	3	0	0	0	12
N	3m	1	50	*Lutjanus apodus*	0	0	12	4	0	0	0	16
N	3m	1	50	*Lutjanus griseus*	0	0	3	4	0	0	0	7
N	3m	2	20	*Epinephelus striatus*	0	0	1	0	0	0	0	1
N	3m	2	20	*Lutjanus analis*	0	0	0	0	1	0	0	1
N	3m	2	20	*Lutjanus apodus*	0	0	3	0	0	0	0	3
N	3m	2	20	*Lutjanus griseus*	0	0	10	3	0	0	0	13
N	3m	2	20	*Scarus guacamaia*	0	0	0	4	0	0	0	4
N	3m	2	30	*Haemulon sciurus*	0	0	5	0	0	0	0	5
N	3m	2	30	*Lutjanus apodus*	0	0	10	6	0	0	0	16
N	3m	2	30	*Lutjanus griseus*	0	0	4	12	0	0	0	16
N	3m	2	30	*Lutjanus griseus*	0	0	0	0	0	0	0	0
N	3m	2	30	*Ocyurus chrysurus*	0	0	2	3	0	0	0	5
N	3m	2	30	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	3m	2	30	*Sparisoma radians*	0	0	6	0	0	0	0	6
N	3m	2	40	*Lutjanus apodus*	0	0	2	0	0	0	0	2
N	3m	2	40	*Lutjanus griseus*	0	0	6	4	0	0	0	10
N	3m	2	40	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	3m	2	50	*Lutjanus apodus*	0	0	5	15	0	0	0	20
N	3m	2	50	*Lutjanus griseus*	0	0	13	0	2	0	0	15
N	3m	2	50	*Scarus guacamaia*	0	0	0	2	0	0	0	2
N	3m	3	10	*Caranx latus*	0	0	0	1	0	0	0	1
N	3m	3	10	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
N	3m	3	20	*Lutjanus apodus*	0	0	0	9	0	0	0	9
N	3m	3	20	*Lutjanus griseus*	0	0	0	8	1	0	0	9
N	3m	3	20	*Lutjanus mahogoni*	0	0	0	0	1	0	0	1
N	3m	3	20	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	3m	3	30	*Caranx ruber*	0	0	0	0	1	0	0	1
N	3m	3	30	*Haemulon sciurus*	0	0	12	0	0	0	0	12
N	3m	3	30	*Lutjanus apodus*	0	0	12	2	2	0	0	16
N	3m	3	30	*Lutjanus griseus*	0	0	16	10	2	0	0	28
N	3m	3	30	*Mulliodichthys martinicus*	0	8	0	0	0	0	0	8
N	3m	3	30	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
N	3m	3	30	*Scarus guacamaia*	0	0	0	3	0	0	0	3
N	3m	3	40	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	3	40	*Lutjanus apodus*	0	0	3	0	0	0	0	3
N	3m	3	40	*Lutjanus griseus*	0	0	7	4	0	0	0	11
N	3m	3	50	*Caranx ruber*	0	1	0	0	0	0	0	1
N	3m	3	50	*Epinephelus striatus*	0	0	1	0	0	0	0	1
N	3m	3	50	*Lutjanus apodus*	0	0	9	2	0	0	0	11
N	3m	3	50	*Lutjanus griseus*	0	0	10	2	0	0	0	12
N	3m	3	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1

N	3m	3	50	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	3m	4	20	*Epinephelus striatus*	0	0	1	0	0	0	0	1
N	3m	4	20	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	4	20	*Lutjanus apodus*	0	0	0	4	0	0	0	4
N	3m	4	20	*Lutjanus griseus*	0	0	2	4	4	0	0	10
N	3m	4	20	*Lutjanus mahogoni*	0	0	0	0	1	0	0	1
N	3m	4	30	*Caranx ruber*	0	1	0	0	1	0	0	2
N	3m	4	30	*Haemulon flavolineatum*	0	0	1	0	0	0	0	1
N	3m	4	30	*Haemulon sciurus*	0	0	24	3	0	0	0	27
N	3m	4	30	*Lutjanus apodus*	0	0	8	4	0	0	0	12
N	3m	4	30	*Lutjanus griseus*	0	0	11	8	0	0	0	19
N	3m	4	30	*Sparisoma radians*	0	0	4	1	0	0	0	5
N	3m	4	40	*Lutjanus apodus*	0	0	3	0	0	0	0	3
N	3m	4	40	*Lutjanus griseus*	0	0	8	2	0	0	0	10
N	3m	4	50	*Lutjanus apodus*	0	0	10	11	0	0	0	21
N	3m	4	50	*Lutjanus griseus*	0	0	6	6	0	0	0	12
N	3m	5	0	*Haemulon plumieri*	0	0	1	0	0	0	0	1
N	3m	5	10	*Ocyurus chrysurus*	0	3	0	0	0	0	0	3
N	3m	5	20	*Lutjanus apodus*	0	0	12	8	2	0	0	22
N	3m	5	20	*Lutjanus mahogoni*	0	0	0	0	1	0	0	1
N	3m	5	20	*Ocyurus chrysurus*	0	0	0	2	4	0	0	6
N	3m	5	20	*Scarus guacamaia*	0	0	0	4	0	0	0	4
N	3m	5	30	*Haemulon sciurus*	0	0	30	0	0	0	0	30
N	3m	5	30	*Lutjanus apodus*	0	0	0	13	2	0	0	15
N	3m	5	30	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	3m	5	30	*Lutjanus griseus*	0	0	0	14	4	0	0	18
N	3m	5	40	*Lutjanus apodus*	0	0	4	0	0	0	0	4
N	3m	5	40	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	3m	5	40	*Lutjanus griseus*	0	0	13	0	0	0	0	13
N	3m	5	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	5	50	*Gerres cinereus*	0	0	3	0	0	0	0	3
N	3m	5	50	*Lutjanus apodus*	0	0	4	0	0	0	0	4
N	3m	5	50	*Lutjanus griseus*	0	0	12	0	0	0	0	12
N	3m	5	50	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	3m	6	10	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	3m	6	10	*Lutjanus apodus*	0	0	0	3	0	0	0	3
N	3m	6	10	*Lutjanus griseus*	0	0	0	6	0	0	0	6
N	3m	6	10	*Scarus guacamaia*	0	0	0	4	0	0	0	4
N	3m	6	20	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	6	20	*Lutjanus griseus*	0	0	0	2	0	0	0	2
N	3m	6	30	*Caranx ruber*	0	0	0	1	0	0	0	1
N	3m	6	30	*Haemulon sciurus*	0	0	27	0	0	0	0	27
N	3m	6	30	*Lutjanus apodus*	0	0	7	9	0	0	0	16
N	3m	6	30	*Lutjanus griseus*	0	0	12	8	1	0	0	21
N	3m	6	40	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	3m	6	40	*Lutjanus apodus*	0	0	13	3	0	0	0	16
N	3m	6	40	*Lutjanus griseus*	0	0	18	0	0	0	0	18
N	3m	6	50	*Lutjanus apodus*	0	0	4	2	0	0	0	6
N	3m	6	50	*Lutjanus griseus*	0	0	8	0	0	0	0	8
N	3m	7	0	*Sphoeroides testudineus*	0	0	0	1	0	0	0	1
N	3m	7	20	*Lutjanus apodus*	0	0	0	3	0	0	0	3
N	3m	7	20	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	7	30	*Haemulon sciurus*	0	0	28	0	0	0	0	28
N	3m	7	30	*Lutjanus apodus*	0	0	18	6	0	0	0	24
N	3m	7	30	*Lutjanus griseus*	0	0	5	6	2	0	0	13
N	3m	7	30	*Lutjanus mahogoni*	0	0	0	0	1	0	0	1
N	3m	7	40	*Haemulon sciurus*	0	0	1	1	0	0	0	2
N	3m	7	40	*Lutjanus apodus*	0	0	10	7	0	0	0	17
N	3m	7	40	*Lutjanus griseus*	0	0	19	3	0	0	0	22
N	3m	7	50	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	7	50	*Lutjanus apodus*	0	0	9	0	1	0	0	10
N	3m	7	50	*Lutjanus griseus*	0	0	9	0	1	0	0	10
N	3m	7	50	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	3m	8	0	*Gerres cinereus*	0	0	2	0	0	0	0	2

N	3m	8	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	8	10	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	3m	8	10	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	8	30	*Haemulon sciurus*	0	0	21	0	0	0	0	21
N	3m	8	30	*Lutjanus apodus*	0	0	15	0	0	0	0	15
N	3m	8	30	*Lutjanus griseus*	0	0	8	10	0	0	0	18
N	3m	8	30	*Lutjanus griseus*	0	0	0	0	0	0	0	0
N	3m	8	30	*Lutjanus mahogoni*	0	0	0	0	1	0	0	1
N	3m	8	30	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	8	30	*Ocyurus chrysurus*	0	0	1	3	0	0	0	4
N	3m	8	40	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	3m	8	40	*Lutjanus apodus*	0	0	13	0	0	0	0	13
N	3m	8	40	*Lutjanus griseus*	0	0	19	2	0	0	0	21
N	3m	8	40	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	3m	8	50	*Lutjanus apodus*	0	0	2	1	0	0	0	3
N	3m	8	50	*Lutjanus griseus*	0	0	8	3	0	0	0	11
N	3m	9	10	*Lutjanus griseus*	0	0	0	2	2	0	0	4
N	3m	9	10	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	9	20	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	3m	9	30	*Epinephelus striatus*	0	0	1	0	0	0	0	1
N	3m	9	30	*Haemulon sciurus*	0	0	21	0	0	0	0	21
N	3m	9	30	*Lutjanus apodus*	0	0	0	16	8	2	0	26
N	3m	9	30	*Lutjanus cyanopterus*	0	0	0	0	1	0	0	1
N	3m	9	30	*Lutjanus griseus*	0	0	6	5	0	0	0	11
N	3m	9	30	*Mulliodichthys martinicus*	0	0	4	0	0	0	0	4
N	3m	9	30	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	9	30	*Sparisoma radians*	0	0	4	0	0	0	0	4
N	3m	9	40	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	3m	9	40	*Lutjanus apodus*	0	0	11	4	0	0	0	15
N	3m	9	40	*Lutjanus griseus*	0	0	10	6	1	0	0	17
N	3m	9	40	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	3m	9	40	*Scarus guacamaia*	0	0	0	0	2	0	0	2
N	3m	9	50	*Lutjanus apodus*	0	0	1	3	0	0	0	4
N	3m	9	50	*Lutjanus griseus*	0	0	8	2	0	0	0	10
N	3m	10	10	*Lutjanus griseus*	0	0	0	3	0	0	0	3
N	3m	10	10	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	3m	10	20	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	10	30	*Epinephelus striatus*	0	0	1	0	0	0	0	1
N	3m	10	30	*Haemulon parrai*	0	0	1	0	0	0	0	1
N	3m	10	30	*Haemulon sciurus*	0	0	24	0	0	0	0	24
N	3m	10	30	*Lutjanus apodus*	0	0	15	8	0	0	0	23
N	3m	10	30	*Lutjanus griseus*	0	0	3	10	0	0	0	13
N	3m	10	40	*Lutjanus apodus*	0	0	14	3	0	0	0	17
N	3m	10	40	*Lutjanus griseus*	0	0	13	4	0	0	0	17
N	3m	10	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	10	40	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	3m	10	50	*Lutjanus apodus*	0	0	2	3	0	0	0	5
N	3m	10	50	*Lutjanus griseus*	0	0	3	2	0	0	0	5
N	3m	11	10	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	3m	11	10	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	11	20	*Haemulon sciurus*	0	0	11	11	0	0	0	22
N	3m	11	20	*Lutjanus apodus*	0	0	12	25	6	0	0	43
N	3m	11	20	*Lutjanus griseus*	0	0	15	15	12	0	0	42
N	3m	11	20	*Ocyurus chrysurus*	0	3	0	0	0	0	0	3
N	3m	11	20	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	3m	11	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	3m	11	30	*Lutjanus griseus*	0	0	0	6	3	0	0	9
N	3m	11	30	*Ocyurus chrysurus*	0	3	0	0	0	0	0	3
N	3m	11	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	3m	11	50	*Haemulon flavolineatum*	0	0	8	0	0	0	0	8
N	3m	11	50	*Haemulon sciurus*	0	0	8	0	0	0	0	8
N	3m	11	50	*Lutjanus apodus*	0	0	3	10	4	0	0	17
N	3m	11	50	*Lutjanus griseus*	0	0	5	11	8	0	0	24
N	3m	11	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1

N	3m	11	50	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	3m	12	10	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	3m	12	10	*Lutjanus griseus*	0	0	1	0	0	0	0	1
N	3m	12	10	*Ocyurus chrysurus*	0	3	2	0	0	0	0	5
N	3m	12	20	*Lutjanus apodus*	0	0	0	6	8	0	0	14
N	3m	12	20	*Lutjanus griseus*	0	0	0	8	6	0	0	14
N	3m	12	20	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	3m	12	20	*Mulliodichthys martinicus*	0	0	0	8	0	0	0	8
N	3m	12	20	*Ocyurus chrysurus*	0	0	4	0	0	0	0	
N	3m	12	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	3m	12	30	*Lutjanus griseus*	0	0	6	1	0	0	0	7
N	3m	12	40	*Haemulon plumieri*	0	0	1	0	0	0	0	1
N	3m	12	40	*Haemulon sciurus*	0	0	8	0	0	0	0	8
N	3m	12	40	*Lutjanus apodus*	0	0	2	30	7	0	0	39
N	3m	12	40	*Lutjanus griseus*	0	0	3	15	4	0	0	22
N	3m	12	50	*Haemulon sciurus*	0	0	4	0	0	0	0	4
N	3m	12	50	*Lutjanus apodus*	0	0	6	3	3	0	0	12
N	3m	12	50	*Lutjanus griseus*	0	0	4	9	6	0	0	19
N	3m	13	0	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
N	3m	13	10	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	3m	13	20	*Haemulon plumieri*	0	0	0	1	0	0	0	1
N	3m	13	20	*Haemulon sciurus*	0	0	3	3	0	0	0	6
N	3m	13	20	*Lutjanus apodus*	0	0	0	3	8	0	0	11
N	3m	13	20	*Lutjanus griseus*	0	0	2	7	9	0	0	18
N	3m	13	20	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	13	30	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	3m	13	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	3m	13	30	*Lutjanus griseus*	0	0	6	0	0	0	0	6
N	3m	13	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	13	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	13	40	*Haemulon sciurus*	0	0	6	0	0	0	0	6
N	3m	13	40	*Lutjanus apodus*	0	0	4	20	13	0	0	37
N	3m	13	40	*Lutjanus griseus*	0	0	0	13	0	0	0	13
N	3m	13	40	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	13	50	*Haemulon sciurus*	0	0	2	0	0	0	0	2
N	3m	13	50	*Lutjanus apodus*	0	0	1	5	3	0	0	9
N	3m	13	50	*Lutjanus griseus*	0	0	0	5	2	0	0	7
N	3m	13	50	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	14	10	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	14	20	*Lutjanus apodus*	0	0	0	3	7	0	0	10
N	3m	14	20	*Lutjanus griseus*	0	0	12	4	16	0	0	32
N	3m	14	20	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
N	3m	14	20	*Ocyurus chrysurus*	0	0	0	2	0	0	0	2
N	3m	14	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	14	30	*Lutjanus apodus*	0	0	0	0	1	0	0	1
N	3m	14	30	*Lutjanus griseus*	0	0	6	0	3	0	0	9
N	3m	14	30	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	14	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	14	40	*Haemulon plumieri*	0	0	0	1	0	0	0	1
N	3m	14	40	*Haemulon sciurus*	0	0	6	3	0	0	0	9
N	3m	14	40	*Lutjanus apodus*	0	0	27	16	6	0	0	49
N	3m	14	40	*Lutjanus griseus*	0	0	10	11	8	0	0	29
N	3m	14	50	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	14	50	*Haemulon sciurus*	0	0	0	11	0	0	0	11
N	3m	14	50	*Lutjanus apodus*	0	0	11	12	7	0	0	30
N	3m	14	50	*Lutjanus griseus*	0	0	2	5	3	0	0	10
N	3m	14	50	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	3m	15	10	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	15	10	*Ocyurus chrysurus*	0	1	1	0	0	0	0	2
N	3m	15	20	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	3m	15	20	*Lutjanus apodus*	0	0	0	0	3	0	0	3
N	3m	15	20	*Lutjanus griseus*	0	0	3	2	6	0	0	11
N	3m	15	20	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	15	30	*Haemulon sciurus*	0	0	1	0	0	0	0	1

N	3m	15	30	*Lutjanus apodus*	0	0	0	3	0	0	0	3
N	3m	15	30	*Lutjanus griseus*	0	0	4	2	1	0	0	7
N	3m	15	40	*Haemulon plumieri*	0	0	0	1	0	0	0	1
N	3m	15	40	*Haemulon sciurus*	0	0	4	9	0	0	0	13
N	3m	15	40	*Lutjanus apodus*	0	0	22	19	10	0	0	51
N	3m	15	40	*Lutjanus griseus*	0	0	0	12	9	0	0	21
N	3m	15	50	*Haemulon flavolineatum*	0	0	0	2	0	0	0	2
N	3m	15	50	*Haemulon sciurus*	0	0	3	0	0	0	0	3
N	3m	15	50	*Lutjanus apodus*	0	0	8	9	2	0	0	19
N	3m	15	50	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	15	50	*Ocyurus chrysurus*	0	0	2	6	2	0	0	10
N	3m	16	10	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	16	10	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	3m	16	20	*Lutjanus apodus*	0	0	0	3	1	0	0	4
N	3m	16	20	*Lutjanus griseus*	0	0	3	0	4	0	0	7
N	3m	16	20	*Mulliodichthys martinicus*	0	0	6	4	0	0	0	10
N	3m	16	20	*Ocyurus chrysurus*	0	2	4	0	0	0	0	6
N	3m	16	30	*Lutjanus apodus*	0	0	0	2	0	0	0	2
N	3m	16	30	*Lutjanus griseus*	0	0	3	1	0	0	0	4
N	3m	16	30	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
N	3m	16	30	*Scarus taeniopterus*	0	1	0	0	0	0	0	1
N	3m	16	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	16	40	*Haemulon sciurus*	0	0	8	4	0	0	0	12
N	3m	16	40	*Lutjanus apodus*	0	0	27	19	9	0	0	55
N	3m	16	40	*Lutjanus griseus*	0	0	15	6	11	0	0	32
N	3m	16	50	*Haemulon sciurus*	0	0	8	3	0	0	0	11
N	3m	16	50	*Lutjanus apodus*	0	0	0	8	4	0	0	12
N	3m	16	50	*Lutjanus griseus*	0	0	6	2	4	0	0	12
N	3m	16	50	*Ocyurus chrysurus*	0	0	0	6	0	0	0	6
N	3m	17	10	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	3m	17	20	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	3m	17	20	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	3m	17	20	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	3m	17	20	*Mulliodichthys martinicus*	0	0	0	4	0	0	0	4
N	3m	17	20	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	3m	17	30	*Lutjanus apodus*	0	0	2	0	0	0	0	2
N	3m	17	30	*Lutjanus griseus*	0	0	4	0	3	0	0	7
N	3m	17	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	17	40	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	17	40	*Calamus bajonado*	0	0	0	0	0	1	0	1
N	3m	17	40	*Haemulon sciurus*	0	0	8	3	0	0	0	11
N	3m	17	40	*Lutjanus apodus*	0	0	22	20	9	0	0	51
N	3m	17	40	*Lutjanus griseus*	0	0	4	15	6	0	0	25
N	3m	17	40	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	17	50	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	17	50	*Haemulon plumieri*	0	0	0	1	0	0	0	1
N	3m	17	50	*Haemulon sciurus*	0	0	8	2	0	0	0	10
N	3m	17	50	*Lutjanus apodus*	0	0	3	7	9	0	0	19
N	3m	17	50	*Lutjanus griseus*	0	0	3	10	5	0	0	18
N	3m	17	50	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	3m	18	10	*Chaetodon capistratus*	1	0	0	0	0	0	0	1
N	3m	18	10	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	3m	18	10	*Mulliodichthys martinicus*	0	0	3	0	0	0	0	3
N	3m	18	10	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	3m	18	30	*Lutjanus griseus*	0	0	2	0	0	0	0	2
N	3m	18	40	*Haemulon sciurus*	0	0	12	4	0	0	0	16
N	3m	18	40	*Lutjanus apodus*	0	0	30	22	11	0	0	63
N	3m	18	40	*Lutjanus griseus*	0	0	8	12	8	0	0	28
N	3m	18	50	*Haemulon sciurus*	0	0	11	8	0	0	0	19
N	3m	18	50	*Lutjanus apodus*	0	0	0	6	4	0	0	10
N	3m	18	50	*Lutjanus griseus*	0	0	2	10	4	0	0	16
N	3m	19	10	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	3m	19	10	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	3m	19	20	*Lutjanus griseus*	0	0	0	0	5	0	0	5

N	3m	19	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	3m	19	40	*Haemulon sciurus*	0	0	17	2	0	0	0	19
N	3m	19	40	*Lutjanus apodus*	0	0	20	20	8	0	0	48
N	3m	19	40	*Lutjanus griseus*	0	0	8	12	10	0	0	30
N	3m	19	50	*Haemulon sciurus*	0	0	17	2	0	0	0	19
N	3m	19	50	*Lutjanus apodus*	0	0	0	8	4	0	0	12
N	3m	19	50	*Lutjanus griseus*	0	0	8	12	10	0	0	30
N	3m	19	50	*Mulliodichthys martinicus*	0	0	3	3	0	0	0	6
N	3m	20	0	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	20	10	*Chaetodon capistratus*	1	0	0	0	0	0	0	1
N	3m	20	10	*Gerres cinereus*	0	5	2	0	0	0	0	7
N	3m	20	10	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	3m	20	30	*Lutjanus apodus*	0	0	0	0	1	0	0	1
N	3m	20	30	*Lutjanus griseus*	0	0	3	0	4	0	0	7
N	3m	20	30	*Mulliodichthys martinicus*	0	0	5	0	0	0	0	5
N	3m	20	30	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	3m	20	40	*Haemulon sciurus*	0	0	14	3	0	0	0	17
N	3m	20	40	*Lutjanus apodus*	0	0	20	17	8	0	0	45
N	3m	20	40	*Lutjanus griseus*	0	0	8	7	12	0	0	27
N	3m	20	40	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
N	3m	20	50	*Gerres cinereus*	0	0	3	0	0	0	0	3
N	3m	20	50	*Haemulon sciurus*	0	0	6	2	0	0	0	8
N	3m	20	50	*Lutjanus apodus*	0	0	0	5	9	0	0	14
N	3m	20	50	*Lutjanus griseus*	0	0	0	3	7	0	0	10
N	3m	20	50	*Mulliodichthys martinicus*	0	0	3	2	0	0	0	5
N	3m	21	20	*Haemulon flavolineatum*	0	0	0	2	0	0	0	2
N	3m	21	20	*Haemulon sciurus*	0	0	24	5	0	0	0	29
N	3m	21	20	*Lutjanus apodus*	0	0	0	6	0	0	0	6
N	3m	21	20	*Lutjanus griseus*	0	0	0	7	0	0	0	7
N	3m	21	30	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	21	30	*Haemulon sciurus*	0	0	0	59	0	0	0	59
N	3m	21	30	*Lutjanus apodus*	0	0	0	3	9	0	0	12
N	3m	21	30	*Lutjanus griseus*	0	0	0	2	5	0	0	7
N	3m	21	30	*Sphoeroides testudineus*	0	0	0	1	0	0	0	1
N	3m	21	40	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	21	40	*Haemulon flavolineatum*	0	0	0	2	0	0	0	2
N	3m	21	40	*Lutjanus apodus*	0	0	0	4	2	0	0	6
N	3m	21	40	*Lutjanus griseus*	0	0	0	6	2	0	0	8
N	3m	21	40	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
N	3m	21	50	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	21	50	*Lutjanus apodus*	0	0	0	10	4	0	0	14
N	3m	21	50	*Lutjanus griseus*	0	0	0	17	4	0	0	21
N	3m	22	20	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	22	20	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
N	3m	22	30	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	22	30	*Haemulon flavolineatum*	0	0	6	43	0	0	0	49
N	3m	22	30	*Haemulon plumieri*	0	0	0	2	0	0	0	2
N	3m	22	30	*Lutjanus apodus*	0	0	0	8	4	0	0	12
N	3m	22	30	*Lutjanus griseus*	0	0	0	8	4	0	0	12
N	3m	22	30	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	3m	22	40	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	22	40	*Lutjanus apodus*	0	0	0	11	3	0	0	14
N	3m	22	40	*Lutjanus griseus*	0	0	0	9	0	0	0	9
N	3m	22	50	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
N	3m	22	50	*Lutjanus apodus*	0	0	0	24	3	0	0	27
N	3m	22	50	*Lutjanus griseus*	0	0	0	16	2	0	0	18
N	3m	23	10	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	3m	23	20	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	23	20	*Lutjanus apodus*	0	0	0	0	1	0	0	1
N	3m	23	20	*Lutjanus griseus*	0	0	0	0	2	0	0	2
N	3m	23	20	*Mulliodichthys martinicus*	0	0	3	2	0	0	0	5
N	3m	23	20	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
N	3m	23	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	23	30	*Haemulon sciurus*	0	0	5	48	1	0	0	54

N	3m	23	30	*Lutjanus apodus*	0	0	0	8	0	0	0	8
N	3m	23	30	*Lutjanus griseus*	0	0	0	4	0	0	0	4
N	3m	23	30	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	3m	23	30	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	3m	23	40	*Haemulon sciurus*	0	0	0	0	1	0	0	1
N	3m	23	40	*Lutjanus apodus*	0	0	0	10	0	0	0	10
N	3m	23	40	*Lutjanus griseus*	0	0	0	11	0	0	0	11
N	3m	23	50	*Lutjanus apodus*	0	0	0	23	5	0	0	28
N	3m	23	50	*Lutjanus griseus*	0	0	0	11	4	0	0	15
N	3m	23	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	24	10	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	24	10	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	3m	24	20	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	24	20	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	24	20	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	24	20	*Scarus croicensis*	0	5	0	0	0	0	0	5
N	3m	24	30	*Haemulon flavolineatum*	0	0	0	5	0	0	0	5
N	3m	24	30	*Haemulon sciurus*	0	0	0	47	1	0	0	48
N	3m	24	30	*Lutjanus apodus*	0	0	0	6	6	0	0	12
N	3m	24	30	*Lutjanus griseus*	0	0	0	5	0	0	0	5
N	3m	24	30	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	3m	24	30	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
N	3m	24	30	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	3m	24	40	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	24	40	*Lutjanus apodus*	0	0	0	12	0	0	0	12
N	3m	24	40	*Lutjanus griseus*	0	0	0	12	3	0	0	15
N	3m	24	40	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	3m	24	40	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	3m	24	50	*Haemulon sciurus*	0	0	0	5	0	0	0	5
N	3m	24	50	*Lutjanus apodus*	0	0	0	19	7	0	0	26
N	3m	24	50	*Lutjanus griseus*	0	0	0	14	0	0	0	14
N	3m	25	0	*Ocyurus chrysurus*	1	0	0	0	0	0	0	1
N	3m	25	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	25	10	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	25	10	*Ocyurus chrysurus*	0	0	2	4	0	0	0	6
N	3m	25	20	*Haemulon sciurus*	0	0	0	0	1	0	0	1
N	3m	25	20	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	25	30	*Haemulon sciurus*	0	0	0	23	2	0	0	25
N	3m	25	30	*Lutjanus apodus*	0	0	0	11	1	0	0	12
N	3m	25	30	*Lutjanus griseus*	0	0	0	10	0	0	0	10
N	3m	25	30	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	3m	25	30	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
N	3m	25	40	*Lutjanus apodus*	0	0	0	17	0	0	0	17
N	3m	25	40	*Lutjanus griseus*	0	0	0	16	3	0	0	19
N	3m	25	50	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	3m	25	50	*Lutjanus apodus*	0	0	0	26	7	0	0	33
N	3m	25	50	*Lutjanus griseus*	0	0	0	12	5	0	0	17
N	3m	26	0	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	26	0	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	3m	26	0	*Sphyraena barracuda*	0	0	0	1	0	0	0	1
N	3m	26	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	26	10	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	3m	26	20	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	3m	26	20	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	3m	26	20	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	26	30	*Haemulon plumieri*	0	0	0	2	0	0	0	2
N	3m	26	30	*Haemulon sciurus*	0	0	0	32	2	0	0	34
N	3m	26	30	*Lutjanus apodus*	0	0	0	8	0	0	0	8
N	3m	26	30	*Lutjanus griseus*	0	0	0	8	0	0	0	8
N	3m	26	30	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	3m	26	30	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	26	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	26	30	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	3m	26	30	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1

N	3m	26	40	*Haemulon sciurus*	0	0	0	0	1	0	0	1
N	3m	26	40	*Lutjanus apodus*	0	0	0	13	0	0	0	13
N	3m	26	40	*Lutjanus griseus*	0	0	0	12	2	0	0	14
N	3m	26	40	*Sparisoma radians*	0	2	0	0	0	0	0	2
N	3m	26	50	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	3m	26	50	*Lutjanus apodus*	0	0	0	22	8	0	0	30
N	3m	26	50	*Lutjanus griseus*	0	0	0	17	2	0	0	19
N	3m	26	50	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
N	3m	26	50	*Pseudupeneus maculatus*	0	0	0	1	0	0	0	1
N	3m	27	0	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	27	0	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	27	0	*Sphyraena barracuda*	0	0	0	1	0	0	0	1
N	3m	27	20	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	27	20	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	3m	27	20	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	27	30	*Haemulon sciurus*	0	0	0	37	2	0	0	39
N	3m	27	30	*Lutjanus apodus*	0	0	0	9	0	0	0	9
N	3m	27	30	*Lutjanus griseus*	0	0	0	0	7	0	0	7
N	3m	27	30	*Ocyurus chrysurus*	0	0	0	4	0	0	0	4
N	3m	27	30	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	3m	27	30	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	27	30	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	3m	27	40	*Lutjanus apodus*	0	0	0	19	0	0	0	19
N	3m	27	40	*Lutjanus griseus*	0	0	0	15	0	0	0	15
N	3m	27	50	*Haemulon plumieri*	0	0	0	1	0	0	0	1
N	3m	27	50	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	3m	27	50	*Lutjanus apodus*	0	0	0	22	4	0	0	26
N	3m	27	50	*Lutjanus griseus*	0	0	0	12	3	0	0	15
N	3m	27	50	*Ocyurus chrysurus*	0	0	0	2	0	0	0	2
N	3m	28	10	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	3m	28	10	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	3m	28	20	*Haemulon plumieri*	0	0	0	1	0	0	0	1
N	3m	28	30	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
N	3m	28	30	*Haemulon plumieri*	0	0	0	2	0	0	0	2
N	3m	28	30	*Haemulon sciurus*	0	0	0	31	0	0	0	31
N	3m	28	30	*Lutjanus apodus*	0	0	0	7	0	0	0	7
N	3m	28	30	*Lutjanus griseus*	0	0	0	9	7	0	0	16
N	3m	28	30	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	28	30	*Ocyurus chrysurus*	0	0	0	2	0	0	0	2
N	3m	28	30	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	3m	28	30	*Scarus croicensis*	5	0	0	0	0	0	0	5
N	3m	28	30	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	28	40	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
N	3m	28	40	*Lutjanus apodus*	0	0	0	14	0	0	0	14
N	3m	28	40	*Lutjanus griseus*	0	0	0	16	0	0	0	16
N	3m	28	40	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	3m	28	50	*Haemulon sciurus*	0	0	0	31	0	0	0	31
N	3m	28	50	*Lutjanus apodus*	0	0	0	22	6	0	0	28
N	3m	28	50	*Lutjanus griseus*	0	0	0	12	3	0	0	15
N	3m	28	50	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	3m	28	50	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
N	3m	28	50	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	3m	29	0	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	3m	29	10	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	3m	29	20	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	29	20	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	3m	29	20	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	3m	29	20	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
N	3m	29	30	*Haemulon plumieri*	0	0	0	2	0	0	0	2
N	3m	29	30	*Haemulon sciurus*	0	0	0	28	0	0	0	28
N	3m	29	30	*Lutjanus apodus*	0	0	0	7	2	0	0	9
N	3m	29	30	*Lutjanus griseus*	0	0	0	0	8	0	0	8
N	3m	29	30	*Ocyurus chrysurus*	0	0	0	2	0	0	0	2
N	3m	29	40	*Lutjanus apodus*	0	0	0	14	0	0	0	14

N	3m	29	40	*Lutjanus griseus*	0	0	0	15	0	0	0	15
N	3m	29	40	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	3m	29	40	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	3m	29	50	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	3m	29	50	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	3m	29	50	*Lutjanus apodus*	0	0	0	20	6	0	0	26
N	3m	29	50	*Lutjanus griseus*	0	0	0	13	2	0	0	15
N	3m	30	10	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	3m	30	10	*Lutjanus griseus*	0	0	0	2	0	0	0	2
N	3m	30	10	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
N	3m	30	20	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	3m	30	20	*Haemulon plumieri*	0	0	0	1	0	0	0	1
N	3m	30	20	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	3m	30	20	*Lutjanus griseus*	0	0	1	1	0	0	0	2
N	3m	30	20	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	3m	30	20	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	3m	30	20	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	3m	30	20	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	3m	30	20	*Sparisoma radians*	0	1	0	0	0	0	0	1
N	3m	30	30	*Haemulon plumieri*	0	0	0	3	0	0	0	3
N	3m	30	30	*Haemulon sciurus*	0	0	0	32	0	0	0	32
N	3m	30	30	*Lutjanus apodus*	0	0	0	9	0	0	0	9
N	3m	30	30	*Lutjanus griseus*	0	0	0	13	2	0	0	15
N	3m	30	30	*Mulliodichthys martinicus*	0	0	3	0	0	0	0	3
N	3m	30	30	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
N	3m	30	30	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	3m	30	30	*Scarus croicensis*	7	0	0	0	0	0	0	7
N	3m	30	30	*Sparisoma radians*	0	1	0	0	0	0	0	1
N	3m	30	40	*Haemulon sciurus*	0	0	0	3	1	0	0	4
N	3m	30	40	*Lutjanus apodus*	0	0	0	11	0	0	0	11
N	3m	30	40	*Lutjanus griseus*	0	0	0	6	0	0	0	6
N	3m	30	40	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
N	3m	30	40	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	3m	30	40	*Scarus croicensis*	3	0	0	0	0	0	0	3
N	3m	30	40	*Sparisoma radians*	0	1	0	0	0	0	0	1
N	3m	30	50	*Haemulon sciurus*	0	0	0	5	0	0	0	5
N	3m	30	50	*Lutjanus apodus*	0	0	0	26	6	0	0	32
N	3m	30	50	*Lutjanus griseus*	0	0	0	14	2	0	0	16
S	3m	31	0	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	31	0	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	31	30	*Epinephelus striatus*	0	0	0	1	0	0	0	1
S	3m	31	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	31	50	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
S	3m	31	50	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	32	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	32	0	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	32	20	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	32	30	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	32	30	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	3m	32	40	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	32	40	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	32	40	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
S	3m	32	50	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	32	50	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	32	50	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
S	3m	32	50	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	32	50	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
S	3m	32	50	*Scarus taeniopterus*	6	0	0	0	0	0	0	6
S	3m	32	50	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	33	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	33	0	*Gerres cinereus*	0	0	4	0	0	0	0	4
S	3m	33	10	*Gerres cinereus*	0	0	2	0	0	0	0	2
S	3m	33	10	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	33	20	*Calamus bajonado*	0	0	3	0	0	0	0	3

S	3m	33	20	*Gerres cinereus*	0	0	3	0	0	0	0	3
S	3m	33	20	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	33	20	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	33	30	*Epinephelus striatus*	0	0	0	1	0	0	0	1
S	3m	33	30	*Gerres cinereus*	0	0	2	0	0	0	0	2
S	3m	33	30	*Haemulon sciurus*	0	0	2	0	0	0	0	2
S	3m	33	30	*Scarus taeniopterus*	8	0	0	0	0	0	0	8
S	3m	33	30	*Stegastes leucostictus*	0	2	0	0	0	0	0	2
S	3m	33	40	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	33	50	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	33	50	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	33	50	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	33	50	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	33	50	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
S	3m	33	50	*Sparisoma radians*	0	0	6	0	0	0	0	6
S	3m	34	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	34	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	34	0	*Ocyurus chrysurus*	0	0	1	1	0	0	0	2
S	3m	34	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	34	20	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	34	20	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	34	20	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	34	30	*Epinephelus striatus*	0	0	0	1	0	0	0	1
S	3m	34	30	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	3m	34	30	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	34	30	*Scarus taeniopterus*	7	0	0	0	0	0	0	7
S	3m	34	40	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	34	40	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	34	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	34	50	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	34	50	*Haemulon sciurus*	0	0	5	0	0	0	0	5
S	3m	34	50	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	35	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	35	0	*Gerres cinereus*	0	0	6	0	0	0	0	6
S	3m	35	0	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	35	10	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	35	10	*Gerres cinereus*	0	0	2	0	0	0	0	2
S	3m	35	20	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	35	30	*Haemulon sciurus*	0	0	3	0	0	0	0	3
S	3m	35	30	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	35	30	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	35	30	*Scarus guacamaia*	0	0	0	0	1	0	0	1
S	3m	35	30	*Scarus taeniopterus*	10	0	0	0	0	0	0	10
S	3m	35	50	*Calamus bajonado*	0	0	0	1	0	0	0	1
S	3m	35	50	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	35	50	*Haemulon sciurus*	0	0	2	0	0	0	0	2
S	3m	35	50	*Lutjanus apodus*	0	0	2	0	0	0	0	2
S	3m	35	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	35	50	*Sparisoma radians*	0	0	5	0	0	0	0	5
S	3m	36	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	36	0	*Gerres cinereus*	0	0	4	0	0	0	0	4
S	3m	36	0	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	36	10	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
S	3m	36	20	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	36	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	36	30	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	36	30	*Epinephelus striatus*	0	0	0	1	0	0	0	1
S	3m	36	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	36	30	*Haemulon plumieri*	0	0	1	0	0	0	0	1
S	3m	36	30	*Haemulon sciurus*	0	0	2	0	0	0	0	2
S	3m	36	30	*Halichoeres maculipinna*	2	0	0	0	0	0	0	2
S	3m	36	30	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	36	30	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	36	30	*Scarus taeniopterus*	6	0	0	0	0	0	0	6

S	3m	36	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	36	30	*Stegastes leucostictus*	2	0	0	0	0	0	0	2
S	3m	36	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	36	40	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	36	50	*Calamus bajonado*	0	0	3	0	0	0	0	3
S	3m	36	50	*Haemulon sciurus*	0	0	5	0	0	0	0	5
S	3m	36	50	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	36	50	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	3m	36	50	*Sparisoma radians*	0	0	5	0	0	0	0	5
S	3m	37	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	37	0	*Gerres cinereus*	0	0	4	0	0	0	0	4
S	3m	37	0	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	37	10	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	37	10	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	37	10	*Mulliodichthys martinicus*	0	0	2	1	0	0	0	3
S	3m	37	10	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	37	20	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	37	20	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	3m	37	30	*Halichoeres maculipinna*	1	1	0	0	0	0	0	2
S	3m	37	30	*Scarus taeniopterus*	6	0	0	0	0	0	0	6
S	3m	37	30	*Sparisoma viride*	1	0	0	0	0	0	0	1
S	3m	37	30	*Stegastes leucostictus*	2	0	0	0	0	0	0	2
S	3m	37	40	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	37	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	37	40	*Stegastes leucostictus*	2	0	0	0	0	0	0	2
S	3m	37	50	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	37	50	*Haemulon sciurus*	0	0	6	0	0	0	0	6
S	3m	37	50	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	37	50	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	37	50	*Sparisoma radians*	0	0	5	0	0	0	0	5
S	3m	38	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	38	0	*Gerres cinereus*	0	0	2	0	0	0	0	2
S	3m	38	20	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	38	20	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	38	20	*Sparisoma radians*	0	1	2	0	0	0	0	3
S	3m	38	30	*Epinephelus striatus*	0	0	0	1	0	0	0	1
S	3m	38	30	*Haemulon plumieri*	0	0	1	0	0	0	0	1
S	3m	38	30	*Halichoeres maculipinna*	2	1	0	0	0	0	0	3
S	3m	38	30	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	38	30	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
S	3m	38	30	*Scarus taeniopterus*	6	0	0	0	0	0	0	6
S	3m	38	30	*Stegastes leucostictus*	2	0	0	0	0	0	0	2
S	3m	38	40	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	38	40	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	3m	38	40	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
S	3m	38	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	38	40	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	38	50	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	38	50	*Haemulon sciurus*	0	0	10	0	0	0	0	10
S	3m	38	50	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	38	50	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	38	50	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	39	0	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	39	10	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	39	10	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	3m	39	10	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	39	20	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	39	20	*Haemulon parrai*	0	0	1	3	0	0	0	4
S	3m	39	20	*Haemulon sciurus*	0	0	14	0	0	0	0	14
S	3m	39	20	*Kyphosus sectatrix*	0	0	0	1	0	0	0	1
S	3m	39	20	*Lutjanus apodus*	0	0	2	0	0	0	0	2
S	3m	39	20	*Lutjanus griseus*	0	0	0	4	0	0	0	4
S	3m	39	30	*Haemulon sciurus*	0	0	22	0	0	0	0	22
S	3m	39	30	*Lutjanus griseus*	0	0	0	8	0	0	0	8

S	3m	39	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	39	30	*Scarus taeniopterus*	4	0	0	0	0	0	0	4
S	3m	39	40	*Epinephelus striatus*	0	0	0	1	0	0	0	1
S	3m	39	40	*Haemulon parrai*	0	0	1	3	0	0	0	4
S	3m	39	40	*Haemulon sciurus*	0	0	21	0	0	0	0	21
S	3m	39	40	*Kyphosus sectatrix*	0	0	0	1	0	0	0	1
S	3m	39	40	*Lutjanus apodus*	0	0	0	6	0	0	0	6
S	3m	39	40	*Lutjanus griseus*	0	0	0	8	0	0	0	8
S	3m	39	50	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	39	50	*Haemulon plumieri*	0	0	2	0	0	0	0	2
S	3m	39	50	*Haemulon sciurus*	0	0	12	12	0	0	0	24
S	3m	39	50	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	39	50	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	3m	39	50	*Lutjanus griseus*	0	0	0	2	0	0	0	2
S	3m	39	50	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	40	0	*Gerres cinereus*	0	0	4	0	0	0	0	4
S	3m	40	0	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	40	10	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	40	10	*Haemulon parrai*	0	0	2	0	0	0	0	2
S	3m	40	10	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	3m	40	10	*Kyphosus sectatrix*	0	0	1	1	0	0	0	2
S	3m	40	10	*Ocyurus chrysurus*	0	2	0	0	0	0	0	2
S	3m	40	20	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	40	20	*Haemulon sciurus*	0	0	9	0	0	0	0	9
S	3m	40	20	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	3m	40	20	*Lutjanus griseus*	0	0	0	2	0	0	0	2
S	3m	40	20	*Mulliodichthys martinicus*	0	0	7	0	0	0	0	7
S	3m	40	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	40	30	*Caranx ruber*	0	0	0	0	2	0	0	2
S	3m	40	30	*Diodon hystrix*	0	0	0	0	1	0	0	1
S	3m	40	30	*Haemulon sciurus*	0	0	11	0	0	0	0	11
S	3m	40	30	*Lutjanus apodus*	0	0	7	0	0	0	0	7
S	3m	40	30	*Pomacanthus arcuatus*	0	0	0	3	0	0	0	3
S	3m	40	30	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	40	40	*Calamus bajonado*	0	0	0	0	1	0	0	1
S	3m	40	40	*Haemulon parrai*	0	0	4	2	0	0	0	6
S	3m	40	40	*Haemulon plumieri*	0	0	2	0	0	0	0	2
S	3m	40	40	*Haemulon sciurus*	0	0	12	0	0	0	0	12
S	3m	40	40	*Kyphosus sectatrix*	0	0	1	1	0	0	0	2
S	3m	40	40	*Lutjanus apodus*	0	0	8	3	0	0	0	11
S	3m	40	40	*Lutjanus griseus*	0	0	5	0	0	0	0	5
S	3m	40	50	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	40	50	*Haemulon sciurus*	0	0	24	0	0	0	0	24
S	3m	40	50	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	40	50	*Lutjanus griseus*	0	0	0	3	0	0	0	3
S	3m	40	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	40	50	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	41	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	41	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	41	20	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	3m	41	20	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	41	20	*Lutjanus griseus*	0	0	2	0	0	0	0	2
S	3m	41	30	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	3m	41	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	41	40	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	3m	41	40	*Lutjanus apodus*	0	0	0	8	0	0	0	8
S	3m	41	40	*Lutjanus griseus*	0	0	1	1	0	0	0	2
S	3m	41	40	*Mulliodichthys martinicus*	0	0	3	0	0	0	0	3
S	3m	41	40	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	41	50	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	41	50	*Eucinostomus jonesi*	6	0	0	0	0	0	0	6
S	3m	41	50	*Haemulon sciurus*	0	0	3	0	0	0	0	3
S	3m	41	50	*Lutjanus apodus*	0	0	8	15	0	0	0	23
S	3m	41	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1

S	3m	41	50	*Pomacanthus paru*	0	0	1	0	0	0	0	1
S	3m	41	50	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	42	0	*Gerres cinereus*	0	0	5	0	0	0	0	5
S	3m	42	10	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
S	3m	42	20	*Calamus bajonado*	0	0	4	0	0	0	0	4
S	3m	42	20	*Lutjanus apodus*	0	0	10	5	0	0	0	15
S	3m	42	20	*Lutjanus griseus*	0	0	0	3	0	0	0	3
S	3m	42	20	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	3m	42	20	*Sparisoma radians*	0	0	4	1	0	0	0	5
S	3m	42	30	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	42	30	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	3m	42	40	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	42	40	*Lutjanus apodus*	0	0	5	0	0	0	0	5
S	3m	42	40	*Lutjanus griseus*	0	0	3	0	0	0	0	3
S	3m	42	50	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	42	50	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	3m	42	50	*Lutjanus apodus*	0	0	2	8	0	0	0	10
S	3m	42	50	*Pomacanthus paru*	0	0	0	1	0	0	0	1
S	3m	42	50	*Scarus taeniopterus*	6	0	0	0	0	0	0	6
S	3m	43	0	*Gerres cinereus*	0	0	2	0	0	0	0	2
S	3m	43	20	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	43	20	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	3m	43	20	*Kyphosus sectatrix*	0	0	1	0	0	0	0	1
S	3m	43	20	*Lutjanus apodus*	0	0	5	0	0	0	0	5
S	3m	43	20	*Lutjanus griseus*	0	0	1	0	0	0	0	1
S	3m	43	20	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
S	3m	43	20	*Sparisoma radians*	0	0	4	1	0	0	0	5
S	3m	43	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	43	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	43	40	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	43	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	43	40	*Lutjanus apodus*	0	0	17	0	0	0	0	17
S	3m	43	40	*Lutjanus griseus*	0	0	5	2	0	0	0	7
S	3m	43	50	*Abudefduf saxatilis*	3	0	0	0	0	0	0	3
S	3m	43	50	*Lutjanus apodus*	0	0	19	10	2	0	0	31
S	3m	43	50	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	3m	43	50	*Pomacanthus paru*	0	0	0	1	0	0	0	1
S	3m	43	50	*Scarus taeniopterus*	6	0	0	0	0	0	0	6
S	3m	44	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	44	10	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	44	20	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	44	20	*Lutjanus apodus*	0	0	6	2	0	0	0	8
S	3m	44	20	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	44	30	*Gerres cinereus*	0	1	0	0	0	0	0	1
S	3m	44	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	44	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	44	40	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	3m	44	40	*Lutjanus apodus*	0	0	4	20	0	0	0	24
S	3m	44	40	*Lutjanus griseus*	0	0	2	4	0	0	0	6
S	3m	44	40	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
S	3m	44	40	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	3m	44	50	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	44	50	*Haemulon sciurus*	0	0	3	0	0	0	0	3
S	3m	44	50	*Kyphosus sectatrix*	0	0	1	0	0	0	0	1
S	3m	44	50	*Lutjanus apodus*	0	0	14	7	0	0	0	21
S	3m	44	50	*Pomacanthus paru*	0	0	0	1	0	0	0	1
S	3m	44	50	*Scarus taeniopterus*	6	0	0	0	0	0	0	6
S	3m	44	50	*Sparisoma radians*	0	0	5	0	0	0	0	5
S	3m	45	10	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	45	20	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	45	20	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	45	20	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	45	20	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	45	20	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1

S	3m	45	20	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	45	30	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	3m	45	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	45	40	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	45	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	45	40	*Haemulon sciurus*	0	0	3	0	0	0	0	3
S	3m	45	40	*Lutjanus apodus*	0	0	9	11	0	0	0	20
S	3m	45	40	*Lutjanus griseus*	0	0	1	0	0	0	0	1
S	3m	45	40	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
S	3m	45	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	45	40	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	45	50	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	45	50	*Haemulon sciurus*	0	0	2	0	0	0	0	2
S	3m	45	50	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	3m	45	50	*Lutjanus apodus*	0	0	2	18	2	0	0	22
S	3m	45	50	*Pomacanthus paru*	0	0	0	1	0	0	0	1
S	3m	45	50	*Scarus taeniopterus*	6	0	0	0	0	0	0	6
S	3m	46	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	46	10	*Mulliodichthys martinicus*	0	0	6	0	0	0	0	6
S	3m	46	20	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	3m	46	20	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	46	20	*Lutjanus apodus*	0	0	6	0	0	0	0	6
S	3m	46	20	*Sparisoma radians*	0	0	7	0	0	0	0	7
S	3m	46	30	*Lutjanus apodus*	0	0	3	0	0	0	0	3
S	3m	46	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	46	40	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	46	40	*Haemulon sciurus*	0	0	3	0	0	0	0	3
S	3m	46	40	*Lutjanus apodus*	0	0	9	12	0	0	0	21
S	3m	46	40	*Lutjanus griseus*	0	0	0	7	0	0	0	7
S	3m	46	40	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	3m	46	40	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	46	50	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	46	50	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	46	50	*Haemulon sciurus*	0	0	3	0	0	0	0	3
S	3m	46	50	*Lutjanus apodus*	0	0	8	12	0	0	0	20
S	3m	46	50	*Scarus taeniopterus*	6	0	0	0	0	0	0	6
S	3m	46	50	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	47	10	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	47	20	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	47	20	*Lutjanus apodus*	0	0	4	0	0	0	0	4
S	3m	47	20	*Mulliodichthys martinicus*	0	0	0	3	0	0	0	3
S	3m	47	20	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	47	20	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	47	30	*Lutjanus apodus*	0	0	3	0	0	0	0	3
S	3m	47	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	47	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	47	40	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	3m	47	40	*Lutjanus apodus*	0	0	10	18	0	0	0	28
S	3m	47	40	*Lutjanus griseus*	0	0	8	0	0	0	0	8
S	3m	47	40	*Sparisoma radians*	0	0	5	0	0	0	0	5
S	3m	47	50	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	47	50	*Haemulon sciurus*	0	0	8	3	0	0	0	11
S	3m	47	50	*Halichoeres maculipinna*	2	0	0	0	0	0	0	2
S	3m	47	50	*Lutjanus apodus*	0	0	12	15	0	0	0	27
S	3m	47	50	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
S	3m	47	50	*Scarus taeniopterus*	6	0	0	0	0	0	0	6
S	3m	47	50	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	48	20	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	48	20	*Lutjanus apodus*	0	0	5	0	0	0	0	5
S	3m	48	20	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
S	3m	48	20	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	48	30	*Lutjanus apodus*	0	0	3	0	0	0	0	3
S	3m	48	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	48	40	*Haemulon plumieri*	0	0	0	1	0	0	0	1

S	3m	48	40	*Haemulon sciurus*	0	0	7	0	0	0	0	7
S	3m	48	40	*Lutjanus apodus*	0	0	14	14	0	0	0	28
S	3m	48	40	*Lutjanus griseus*	0	0	0	8	0	0	0	8
S	3m	48	40	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
S	3m	48	40	*Ocyurus chrysurus*	0	0	0	0	1	0	0	1
S	3m	48	40	*Sparisoma radians*	0	0	3	1	0	0	0	4
S	3m	48	50	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	48	50	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	48	50	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	3m	48	50	*Haemulon sciurus*	0	0	10	2	0	0	0	12
S	3m	48	50	*Lutjanus apodus*	0	0	8	18	6	0	0	32
S	3m	48	50	*Mulliodichthys martinicus*	0	0	0	3	0	0	0	3
S	3m	48	50	*Scarus taeniopterus*	6	1	0	0	0	0	0	7
S	3m	48	50	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	49	0	*Gerres cinereus*	0	0	6	0	0	0	0	6
S	3m	49	20	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	49	20	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	3m	49	20	*Lutjanus apodus*	0	0	6	2	0	0	0	8
S	3m	49	20	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
S	3m	49	20	*Ocyurus chrysurus*	0	0	0	1	1	0	0	2
S	3m	49	20	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	49	30	*Lutjanus apodus*	0	0	3	0	0	0	0	3
S	3m	49	30	*Sparisoma radians*	0	0	0	1	0	0	0	1
S	3m	49	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	49	40	*Haemulon sciurus*	0	0	9	0	0	0	0	9
S	3m	49	40	*Lutjanus apodus*	0	0	8	15	1	0	0	24
S	3m	49	40	*Lutjanus griseus*	0	0	0	9	0	0	0	9
S	3m	49	40	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	3m	49	40	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	49	50	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	49	50	*Haemulon sciurus*	0	0	10	2	0	0	0	12
S	3m	49	50	*Lutjanus apodus*	0	0	7	18	6	0	0	31
S	3m	49	50	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
S	3m	49	50	*Scarus taeniopterus*	6	0	0	0	0	0	0	6
S	3m	50	10	*Gerres cinereus*	0	0	2	0	0	0	0	2
S	3m	50	20	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	50	20	*Haemulon flavolineatum*	0	0	0	8	0	0	0	8
S	3m	50	20	*Lutjanus apodus*	0	0	8	0	0	0	0	8
S	3m	50	20	*Lutjanus griseus*	0	0	0	0	1	0	0	1
S	3m	50	20	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	50	30	*Lutjanus apodus*	0	0	2	0	0	0	0	2
S	3m	50	30	*Mulliodichthys martinicus*	0	0	0	0	2	0	0	2
S	3m	50	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	50	40	*Haemulon flavolineatum*	0	0	0	4	0	0	0	4
S	3m	50	40	*Haemulon plumieri*	0	0	0	1	0	0	0	1
S	3m	50	40	*Haemulon sciurus*	0	0	13	6	0	0	0	19
S	3m	50	40	*Lutjanus apodus*	0	0	20	15	0	0	0	35
S	3m	50	40	*Lutjanus griseus*	0	0	2	9	0	0	0	11
S	3m	50	40	*Ocyurus chrysurus*	0	2	0	0	1	0	0	3
S	3m	50	40	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	50	50	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	3m	50	50	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	50	50	*Haemulon sciurus*	0	0	16	6	0	0	0	22
S	3m	50	50	*Halichoeres maculipinna*	2	0	0	0	0	0	0	2
S	3m	50	50	*Lutjanus apodus*	0	0	8	26	10	0	0	44
S	3m	50	50	*Mulliodichthys martinicus*	0	0	0	0	1	0	0	1
S	3m	50	50	*Ocyurus chrysurus*	0	2	0	0	1	0	0	3
S	3m	50	50	*Scarus taeniopterus*	6	0	0	0	0	0	0	6
S	3m	50	50	*Sparisoma radians*	0	0	4	0	0	0	0	4
S	3m	51	10	*Haemulon sciurus*	0	0	0	15	0	0	0	15
S	3m	51	10	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	3m	51	10	*Sparisoma radians*	0	1	0	0	0	0	0	1
S	3m	51	20	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	51	20	*Sparisoma radians*	0	2	0	0	0	0	0	2

S	3m	51	30	*Haemulon sciurus*	0	0	0	15	0	0	0	15
S	3m	51	30	*Lutjanus apodus*	0	0	0	22	0	0	0	22
S	3m	51	40	*Kyphosus sectatrix*	0	0	0	2	0	0	0	2
S	3m	51	40	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	3m	51	40	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	3m	51	50	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	51	50	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	3m	52	10	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	52	10	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	3m	52	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	52	30	*Lutjanus apodus*	0	0	0	16	0	0	0	16
S	3m	52	30	*Mulliodichthys martinicus*	0	0	0	3	0	0	0	3
S	3m	52	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	3m	52	40	*Haemulon sciurus*	0	0	0	4	0	0	0	4
S	3m	52	40	*Lutjanus apodus*	0	0	0	23	0	0	0	23
S	3m	52	40	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
S	3m	53	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	53	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	53	30	*Sparisoma radians*	0	0	7	0	0	0	0	7
S	3m	53	40	*Acanthurus bahianus*	0	0	0	1	0	0	0	1
S	3m	53	40	*Lutjanus apodus*	0	0	18	0	0	0	0	18
S	3m	53	40	*Mulliodichthys martinicus*	0	0	0	4	0	0	0	4
S	3m	53	40	*Sparisoma radians*	0	0	7	0	0	0	0	7
S	3m	53	50	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	53	50	*Gerres cinereus*	0	1	0	0	0	0	0	1
S	3m	53	50	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	54	10	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	54	20	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	54	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	54	30	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
S	3m	54	40	*Lutjanus apodus*	0	0	0	16	0	0	0	16
S	3m	54	40	*Mulliodichthys martinicus*	0	0	0	3	0	0	0	3
S	3m	54	50	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	54	50	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
S	3m	54	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	55	10	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	55	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	55	30	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
S	3m	55	40	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
S	3m	55	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	55	40	*Lutjanus apodus*	0	0	0	15	0	0	0	15
S	3m	55	40	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
S	3m	56	20	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	3m	56	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	56	40	*Lutjanus apodus*	0	0	0	16	0	0	0	16
S	3m	56	40	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
S	3m	56	50	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
S	3m	56	50	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	57	0	*Gerres cinereus*	0	1	1	0	0	0	0	2
S	3m	57	10	*Scarus croicensis*	1	0	0	0	0	0	0	1
S	3m	57	10	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	3m	57	20	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	3m	57	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	57	40	*Lutjanus apodus*	0	0	0	15	0	0	0	15
S	3m	57	40	*Mulliodichthys martinicus*	0	0	0	3	0	0	0	3
S	3m	57	50	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	58	10	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	3m	58	10	*Halichoeres maculipinna*	1	1	0	0	0	0	0	2
S	3m	58	10	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	58	10	*Stegastes leucostictus*	2	0	0	0	0	0	0	2
S	3m	58	20	*Haemulon sciurus*	0	0	12	0	0	0	0	12
S	3m	58	20	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
S	3m	58	20	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	3m	58	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1

S	3m	58	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	3m	58	40	*Lutjanus apodus*	0	0	0	10	0	0	0	10
S	3m	59	0	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	59	10	*Scarus croicensis*	1	0	0	0	0	0	0	1
S	3m	59	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	59	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	3m	59	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	3m	59	40	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	3m	60	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	3m	60	40	*Lutjanus apodus*	0	0	0	2	0	0	0	2
N	1m	61	0	*Lutjanus griseus*	0	0	0	3	0	0	0	3
N	1m	61	10	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	1m	61	10	*Lutjanus griseus*	0	0	0	2	2	0	0	4
N	1m	61	20	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	61	20	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	61	20	*Haemulon sciurus*	0	0	3	0	0	0	0	3
N	1m	61	20	*Lutjanus apodus*	0	0	4	0	0	0	0	4
N	1m	61	20	*Lutjanus griseus*	0	0	5	1	0	0	0	6
N	1m	61	20	*Mulliodichthys martinicus*	0	0	8	0	0	0	0	8
N	1m	61	20	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	61	20	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
N	1m	61	30	*Haemulon sciurus*	0	0	0	55	0	0	0	55
N	1m	61	30	*Lutjanus apodus*	0	0	3	14	0	0	0	17
N	1m	61	30	*Lutjanus griseus*	0	0	8	16	0	0	0	24
N	1m	61	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	1m	61	40	*Chaetodon capistratus*	1	0	0	0	0	0	0	1
N	1m	61	40	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	1m	61	40	*Lutjanus apodus*	0	7	40	0	0	0	0	47
N	1m	61	40	*Lutjanus griseus*	0	0	15	0	0	0	0	15
N	1m	61	40	*Sparisoma radians*	0	2	0	0	0	0	0	2
N	1m	61	50	*Gerres cinereus*	0	3	0	0	0	0	0	3
N	1m	61	50	*Lutjanus apodus*	0	0	8	0	0	0	0	8
N	1m	61	50	*Lutjanus griseus*	0	0	7	1	0	0	0	8
N	1m	61	50	*Sparisoma viride*	0	0	1	0	0	0	0	1
N	1m	61	50	*Sphoeroides testudineus*	0	0	0	1	0	0	0	1
N	1m	62	0	*Gerres cinereus*	0	1	1	0	0	0	0	2
N	1m	62	0	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	62	0	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
N	1m	62	10	*Lutjanus griseus*	0	0	0	3	3	0	0	6
N	1m	62	20	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	62	20	*Diodon hystrix*	0	0	0	0	0	1	0	1
N	1m	62	20	*Haemulon sciurus*	0	0	10	0	0	0	0	10
N	1m	62	20	*Lutjanus griseus*	0	0	0	9	0	0	0	9
N	1m	62	20	*Mulliodichthys martinicus*	0	0	8	0	0	0	0	8
N	1m	62	20	*Scarus taeniopterus*	10	0	0	0	0	0	0	10
N	1m	62	20	*Sphoeroides testudineus*	0	0	0	1	0	0	0	1
N	1m	62	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	62	30	*Haemulon sciurus*	0	0	36	5	0	0	0	41
N	1m	62	30	*Lutjanus apodus*	0	0	40	17	0	0	0	57
N	1m	62	30	*Lutjanus griseus*	0	0	16	8	0	0	0	24
N	1m	62	30	*Ocyurus chrysurus*	0	2	3	0	0	0	0	5
N	1m	62	40	*Chaetodon capistratus*	1	0	0	0	0	0	0	1
N	1m	62	40	*Lutjanus apodus*	0	24	20	0	0	0	0	44
N	1m	62	40	*Lutjanus griseus*	0	2	9	0	0	0	0	11
N	1m	62	40	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	1m	62	40	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	1m	62	40	*Scarus taeniopterus*	2	0	0	0	0	0	0	2
N	1m	62	50	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	62	50	*Haemulon sciurus*	0	0	1	0	0	0	0	1
N	1m	62	50	*Lutjanus apodus*	0	0	3	6	0	0	0	9
N	1m	62	50	*Lutjanus griseus*	0	0	5	8	0	0	0	13
N	1m	62	50	*Scarus taeniopterus*	10	0	0	0	0	0	0	10
N	1m	62	50	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	62	50	*Sphoeroides testudineus*	0	0	0	1	0	0	0	1

N	1m	63	10	*Lutjanus griseus*	0	0	0	2	0	0	0	2
N	1m	63	10	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	63	10	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	63	20	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	63	20	*Haemulon sciurus*	0	0	10	0	0	0	0	10
N	1m	63	20	*Lutjanus apodus*	0	0	6	0	0	0	0	6
N	1m	63	20	*Lutjanus griseus*	0	0	7	2	0	0	0	9
N	1m	63	20	*Mulliodichthys martinicus*	0	0	3	0	0	0	0	3
N	1m	63	20	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	63	20	*Scarus taeniopterus*	12	0	0	0	0	0	0	12
N	1m	63	20	*Sphoeroides testudineus*	0	0	0	2	0	0	0	2
N	1m	63	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	63	30	*Haemulon flavolineatum*	0	0	5	0	0	0	0	5
N	1m	63	30	*Haemulon sciurus*	0	0	26	0	0	0	0	26
N	1m	63	30	*Lutjanus apodus*	0	0	20	29	4	0	0	53
N	1m	63	30	*Lutjanus griseus*	0	0	8	0	0	0	0	8
N	1m	63	30	*Ocyurus chrysurus*	0	0	6	0	0	0	0	6
N	1m	63	30	*Sparisoma radians*	0	0	4	0	0	0	0	4
N	1m	63	40	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	63	40	*Lutjanus apodus*	0	25	20	0	0	0	0	45
N	1m	63	40	*Lutjanus griseus*	0	0	8	0	0	0	0	8
N	1m	63	40	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	1m	63	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	63	40	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	1m	63	40	*Scarus taeniopterus*	2	0	0	0	0	0	0	2
N	1m	63	40	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	63	40	*Sphyraena barracuda*	0	0	1	0	0	0	0	1
N	1m	63	50	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	63	50	*Eucinostomus jonesi*	1	0	0	0	0	0	0	1
N	1m	63	50	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	63	50	*Lutjanus apodus*	0	0	9	0	0	0	0	9
N	1m	63	50	*Lutjanus griseus*	0	0	0	13	0	0	0	13
N	1m	63	50	*Sparisoma radians*	0	2	0	0	0	0	0	2
N	1m	64	10	*Lutjanus griseus*	0	0	0	0	6	0	0	6
N	1m	64	10	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	1m	64	20	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	64	20	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	64	20	*Gerres cinereus*	1	0	0	0	0	0	0	1
N	1m	64	20	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	1m	64	20	*Lutjanus apodus*	0	0	4	0	0	0	0	4
N	1m	64	20	*Lutjanus griseus*	0	0	0	0	3	0	0	3
N	1m	64	20	*Scarus taeniopterus*	14	0	0	0	0	0	0	14
N	1m	64	20	*Sphoeroides testudineus*	0	0	0	2	0	0	0	2
N	1m	64	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	64	30	*Haemulon sciurus*	0	0	40	6	0	0	0	46
N	1m	64	30	*Lutjanus apodus*	0	0	40	15	2	0	0	57
N	1m	64	30	*Lutjanus griseus*	0	0	8	10	4	0	0	22
N	1m	64	30	*Mulliodichthys martinicus*	0	0	8	0	0	0	0	8
N	1m	64	30	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	1m	64	30	*Scarus taeniopterus*	8	0	0	0	0	0	0	8
N	1m	64	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	1m	64	40	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	64	40	*Diodon hystrix*	0	0	0	0	1	0	0	1
N	1m	64	40	*Haemulon sciurus*	0	3	3	0	0	0	0	6
N	1m	64	40	*Lutjanus apodus*	0	20	27	0	0	0	0	47
N	1m	64	40	*Lutjanus griseus*	0	0	9	0	0	0	0	9
N	1m	64	40	*Ocyurus chrysurus*	0	2	0	0	0	0	0	2
N	1m	64	40	*Scarus taeniopterus*	12	0	0	0	0	0	0	12
N	1m	64	40	*Sparisoma radians*	0	4	0	0	0	0	0	4
N	1m	64	50	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	64	50	*Lutjanus apodus*	0	0	6	2	0	0	0	8
N	1m	64	50	*Lutjanus griseus*	0	0	0	7	4	0	0	11
N	1m	64	50	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	1m	65	10	*Gerres cinereus*	0	0	1	0	0	0	0	1

N	1m	65	10	*Lutjanus griseus*	0	0	0	0	2	0	0	2
N	1m	65	10	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	1m	65	20	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	65	20	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	65	20	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	1m	65	20	*Lutjanus apodus*	0	0	0	4	0	0	0	4
N	1m	65	20	*Lutjanus griseus*	0	0	0	3	0	0	0	3
N	1m	65	20	*Scarus taeniopterus*	14	0	0	0	0	0	0	14
N	1m	65	20	*Sphoeroides testudineus*	0	0	0	2	0	0	0	2
N	1m	65	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	65	30	*Haemulon flavolineatum*	0	0	3	0	0	0	0	3
N	1m	65	30	*Haemulon sciurus*	0	0	38	0	0	0	0	38
N	1m	65	30	*Lutjanus apodus*	0	0	40	10	0	0	0	50
N	1m	65	30	*Lutjanus griseus*	0	0	12	2	0	0	0	14
N	1m	65	30	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	1m	65	30	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	1m	65	30	*Scarus taeniopterus*	12	0	0	0	0	0	0	12
N	1m	65	30	*Sphoeroides testudineus*	0	0	0	1	0	0	0	1
N	1m	65	40	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	65	40	*Haemulon sciurus*	0	0	4	0	0	0	0	4
N	1m	65	40	*Lutjanus apodus*	0	20	38	0	0	0	0	58
N	1m	65	40	*Lutjanus griseus*	0	0	12	2	0	0	0	14
N	1m	65	40	*Mulliodichthys martinicus*	0	0	4	0	0	0	0	4
N	1m	65	40	*Scarus croicensis*	0	6	0	0	0	0	0	6
N	1m	65	50	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	65	50	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	65	50	*Lutjanus apodus*	0	0	3	3	0	0	0	6
N	1m	65	50	*Lutjanus griseus*	0	0	0	7	4	0	0	11
N	1m	65	50	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	1m	66	10	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	66	10	*Lutjanus griseus*	0	0	0	4	0	0	0	4
N	1m	66	10	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	1m	66	20	*Gerres cinereus*	0	2	0	0	0	0	0	2
N	1m	66	20	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	1m	66	20	*Lutjanus apodus*	0	0	4	0	0	0	0	4
N	1m	66	20	*Lutjanus griseus*	0	0	3	0	0	0	0	3
N	1m	66	20	*Mulliodichthys martinicus*	0	0	4	0	0	0	0	4
N	1m	66	20	*Scarus taeniopterus*	16	0	0	0	0	0	0	16
N	1m	66	20	*Sphoeroides testudineus*	0	0	0	0	2	0	0	2
N	1m	66	30	*Caranx ruber*	0	1	0	0	0	0	0	1
N	1m	66	30	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	66	30	*Haemulon flavolineatum*	0	0	4	0	0	0	0	4
N	1m	66	30	*Haemulon sciurus*	0	0	30	5	0	0	0	35
N	1m	66	30	*Lutjanus apodus*	0	0	40	13	7	0	0	60
N	1m	66	30	*Lutjanus griseus*	0	0	5	12	6	1	0	24
N	1m	66	30	*Scarus taeniopterus*	12	0	0	0	0	0	0	12
N	1m	66	40	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	66	40	*Haemulon sciurus*	0	4	0	0	0	0	0	4
N	1m	66	40	*Lutjanus apodus*	0	25	10	0	0	0	0	35
N	1m	66	40	*Lutjanus griseus*	0	0	9	0	0	0	0	9
N	1m	66	40	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	1m	66	40	*Scarus croicensis*	0	6	0	0	0	0	0	6
N	1m	66	40	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	66	50	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	66	50	*Eucinostomus jonesi*	1	0	2	0	0	0	0	3
N	1m	66	50	*Lutjanus apodus*	0	0	2	5	0	0	0	7
N	1m	66	50	*Lutjanus griseus*	2	0	8	4	2	0	0	16
N	1m	66	50	*Ocyurus chrysurus*	0	2	1	0	0	0	0	3
N	1m	67	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	67	10	*Lutjanus griseus*	0	0	0	0	3	0	0	3
N	1m	67	10	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	67	20	*Gerres cinereus*	0	6	0	0	0	0	0	6
N	1m	67	20	*Haemulon sciurus*	0	0	0	5	0	0	0	5
N	1m	67	20	*Lutjanus apodus*	0	0	0	4	0	0	0	4

N	1m	67	20	*Mulliodichthys martinicus*	0	0	4	0	0	0	0	4
N	1m	67	20	*Scarus taeniopterus*	14	0	0	0	0	0	0	14
N	1m	67	20	*Sphoeroides testudineus*	0	0	0	0	2	0	0	2
N	1m	67	30	*Haemulon sciurus*	0	0	32	5	0	0	0	37
N	1m	67	30	*Lutjanus apodus*	0	0	28	16	2	0	0	46
N	1m	67	30	*Lutjanus griseus*	0	0	6	10	2	0	0	18
N	1m	67	30	*Mulliodichthys martinicus*	0	0	3	0	0	0	0	3
N	1m	67	30	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	1m	67	30	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	1m	67	30	*Scarus taeniopterus*	9	0	0	0	0	0	0	9
N	1m	67	30	*Sparisoma radians*	0	0	4	0	0	0	0	4
N	1m	67	40	*Haemulon sciurus*	0	0	2	0	0	0	0	2
N	1m	67	40	*Lutjanus apodus*	0	26	0	0	0	0	0	26
N	1m	67	40	*Lutjanus griseus*	0	0	11	0	0	0	0	11
N	1m	67	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	67	40	*Scarus taeniopterus*	9	0	0	0	0	0	0	9
N	1m	67	50	*Lutjanus apodus*	0	0	25	3	0	0	0	28
N	1m	67	50	*Lutjanus griseus*	0	0	0	7	3	0	0	10
N	1m	67	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	67	50	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	68	0	*Gerres cinereus*	0	1	1	0	0	0	0	2
N	1m	68	0	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	1m	68	10	*Lutjanus apodus*	0	0	0	3	0	0	0	3
N	1m	68	10	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	68	10	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	68	20	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	68	20	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	68	20	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	68	20	*Haemulon sciurus*	0	0	0	5	0	0	0	5
N	1m	68	20	*Lutjanus apodus*	0	0	0	4	2	0	0	6
N	1m	68	20	*Lutjanus griseus*	0	0	0	4	7	0	0	11
N	1m	68	20	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	68	20	*Scarus taeniopterus*	17	0	0	0	0	0	0	17
N	1m	68	20	*Sphoeroides testudineus*	0	0	0	0	2	0	0	2
N	1m	68	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	68	30	*Haemulon sciurus*	0	0	30	14	0	0	0	44
N	1m	68	30	*Lutjanus apodus*	0	0	35	8	4	0	0	47
N	1m	68	30	*Lutjanus griseus*	0	0	0	10	4	2	0	16
N	1m	68	30	*Mulliodichthys martinicus*	0	1	4	0	0	0	0	5
N	1m	68	30	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	1m	68	30	*Scarus taeniopterus*	23	0	0	0	0	0	0	23
N	1m	68	30	*Sparisoma radians*	0	0	4	1	0	0	0	5
N	1m	68	40	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	68	40	*Lutjanus apodus*	0	25	22	0	0	0	0	47
N	1m	68	40	*Lutjanus griseus*	0	0	12	0	0	0	0	12
N	1m	68	40	*Lutjanus mahogoni*	0	0	1	0	0	0	0	1
N	1m	68	40	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	1m	68	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	68	40	*Scarus taeniopterus*	10	0	0	0	0	0	0	10
N	1m	68	50	*Gerres cinereus*	0	4	0	0	0	0	0	4
N	1m	68	50	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	68	50	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
N	1m	68	50	*Lutjanus apodus*	0	0	3	2	0	0	0	5
N	1m	68	50	*Lutjanus griseus*	0	0	0	4	3	0	0	7
N	1m	68	50	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	69	10	*Lutjanus cyanopterus*	0	0	0	1	0	0	0	1
N	1m	69	10	*Lutjanus griseus*	0	0	0	0	4	0	0	4
N	1m	69	20	*Haemulon sciurus*	0	0	0	7	0	0	0	7
N	1m	69	20	*Lutjanus apodus*	0	0	0	5	6	0	0	11
N	1m	69	20	*Lutjanus griseus*	0	0	0	6	2	0	0	8
N	1m	69	20	*Sparisoma radians*	0	0	0	2	0	0	0	2
N	1m	69	20	*Sphoeroides testudineus*	0	0	0	2	0	0	0	2
N	1m	69	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	69	30	*Haemulon sciurus*	0	0	45	8	0	0	0	53

N	1m	69	30	*Lutjanus apodus*	0	0	40	11	2	0	0	53
N	1m	69	30	*Lutjanus griseus*	0	0	0	7	12	0	0	19
N	1m	69	30	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	1m	69	40	*Lutjanus apodus*	0	18	7	0	0	0	0	25
N	1m	69	40	*Lutjanus griseus*	0	5	10	0	0	0	0	15
N	1m	69	40	*Mulliodichthys martinicus*	0	0	3	0	0	0	0	3
N	1m	69	40	*Ocyurus chrysurus*	0	2	0	0	0	0	0	2
N	1m	69	40	*Scarus taeniopterus*	9	0	0	0	0	0	0	9
N	1m	69	50	*Chaetodon capistratus*	2	0	0	0	0	0	0	2
N	1m	69	50	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	69	50	*Lutjanus apodus*	0	1	2	5	3	0	0	11
N	1m	69	50	*Lutjanus griseus*	1	0	0	3	3	0	0	7
N	1m	69	50	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	1m	69	50	*Scarus taeniopterus*	11	0	0	0	0	0	0	11
N	1m	69	50	*Sparisoma radians*	0	0	3	0	0	0	0	3
N	1m	70	0	*Gerres cinereus*	0	1	1	0	0	0	0	2
N	1m	70	10	*Lutjanus griseus*	0	0	0	0	3	0	0	3
N	1m	70	10	*Ocyurus chrysurus*	0	2	0	0	0	0	0	2
N	1m	70	20	*Haemulon sciurus*	0	0	3	5	0	0	0	8
N	1m	70	20	*Lutjanus apodus*	0	0	0	9	10	0	0	19
N	1m	70	20	*Lutjanus griseus*	0	0	0	9	2	0	0	11
N	1m	70	20	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	70	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	70	30	*Haemulon sciurus*	0	0	27	5	0	0	0	32
N	1m	70	30	*Lutjanus apodus*	0	0	24	14	0	0	0	38
N	1m	70	30	*Lutjanus griseus*	0	0	9	5	4	0	0	18
N	1m	70	30	*Mulliodichthys martinicus*	0	0	6	0	0	0	0	6
N	1m	70	30	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
N	1m	70	30	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	1m	70	40	*Lutjanus apodus*	0	2	10	0	0	0	0	12
N	1m	70	40	*Lutjanus griseus*	0	0	13	0	0	0	0	13
N	1m	70	40	*Mulliodichthys martinicus*	0	0	8	0	0	0	0	8
N	1m	70	40	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	1m	70	40	*Scarus taeniopterus*	14	0	0	0	0	0	0	14
N	1m	70	50	*Lutjanus apodus*	0	0	0	6	0	0	0	6
N	1m	70	50	*Lutjanus griseus*	0	1	3	9	0	0	0	13
N	1m	70	50	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	71	10	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	71	20	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	71	20	*Sparisoma radians*	0	11	0	0	0	0	0	11
N	1m	71	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	71	30	*Lutjanus griseus*	0	0	6	0	0	0	0	6
N	1m	71	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	71	30	*Pseudupeneus maculatus*	0	0	0	1	0	0	0	1
N	1m	71	30	*Sparisoma radians*	0	11	0	0	0	0	0	11
N	1m	71	40	*Haemulon sciurus*	0	0	0	7	0	0	0	7
N	1m	71	40	*Lutjanus apodus*	0	0	0	16	0	0	0	16
N	1m	71	40	*Lutjanus griseus*	0	0	0	7	0	0	0	7
N	1m	71	40	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	1m	71	40	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	1m	71	40	*Sparisoma radians*	0	3	0	0	0	0	0	3
N	1m	71	50	*Haemulon sciurus*	0	0	0	24	0	0	0	24
N	1m	71	50	*Lutjanus apodus*	0	0	15	30	5	0	0	50
N	1m	71	50	*Lutjanus griseus*	0	0	2	16	0	0	0	18
N	1m	71	50	*Mulliodichthys martinicus*	0	0	1	2	0	0	0	3
N	1m	72	30	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
N	1m	72	30	*Lutjanus griseus*	0	0	2	8	0	0	0	10
N	1m	72	30	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	1m	72	30	*Sparisoma radians*	0	1	2	0	0	0	0	3
N	1m	72	40	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	72	40	*Haemulon sciurus*	0	0	6	6	0	0	0	12
N	1m	72	40	*Lutjanus apodus*	0	0	0	6	2	0	0	8
N	1m	72	40	*Lutjanus griseus*	0	0	0	6	0	0	0	6
N	1m	72	40	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2

N	1m	72	40	*Sparisoma radians*	0	17	0	0	0	0	0	17
N	1m	72	50	*Haemulon sciurus*	0	0	2	13	0	0	0	15
N	1m	72	50	*Lutjanus apodus*	0	0	10	30	0	0	0	40
N	1m	72	50	*Lutjanus griseus*	0	0	0	16	3	0	0	19
N	1m	72	50	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	1m	72	50	*Mulliodichthys martinicus*	0	0	0	3	0	0	0	3
N	1m	73	10	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	1m	73	10	*Ocyurus chrysurus*	0	3	5	0	0	0	0	8
N	1m	73	20	*Lutjanus apodus*	0	0	0	0	1	0	0	1
N	1m	73	20	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	1m	73	20	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
N	1m	73	30	*Lutjanus griseus*	0	0	0	8	1	0	0	9
N	1m	73	30	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	73	30	*Stegastes leucostictus*	0	1	0	0	0	0	0	1
N	1m	73	40	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
N	1m	73	40	*Lutjanus griseus*	0	0	0	5	1	0	0	6
N	1m	73	40	*Scarus croicensis*	0	17	0	0	0	0	0	17
N	1m	73	50	*Haemulon sciurus*	0	0	0	11	0	0	0	11
N	1m	73	50	*Lutjanus apodus*	0	0	6	30	4	0	0	40
N	1m	73	50	*Lutjanus griseus*	0	0	0	11	8	0	0	19
N	1m	73	50	*Lutjanus mahogoni*	0	0	0	1	0	0	0	1
N	1m	73	50	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
N	1m	73	50	*Ocyurus chrysurus*	0	0	3	1	0	0	0	4
N	1m	74	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	74	10	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	1m	74	10	*Scarus taeniopterus*	0	0	16	0	0	0	0	16
N	1m	74	10	*Sparisoma radians*	0	1	0	0	0	0	0	1
N	1m	74	20	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	74	20	*Lutjanus apodus*	0	0	0	7	1	0	0	8
N	1m	74	20	*Lutjanus griseus*	0	0	0	6	0	0	0	6
N	1m	74	20	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	74	20	*Scarus taeniopterus*	0	11	0	0	0	0	0	11
N	1m	74	30	*Lutjanus griseus*	0	0	0	7	0	0	0	7
N	1m	74	30	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
N	1m	74	30	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	74	40	*Haemulon plumieri*	0	0	0	1	0	0	0	1
N	1m	74	40	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	1m	74	40	*Lutjanus apodus*	0	0	4	27	0	0	0	31
N	1m	74	40	*Lutjanus griseus*	0	0	0	8	4	0	0	12
N	1m	74	40	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	1m	74	40	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
N	1m	74	40	*Scarus croicensis*	0	9	0	0	0	0	0	9
N	1m	74	50	*Haemulon sciurus*	0	0	0	9	0	0	0	9
N	1m	74	50	*Lutjanus apodus*	0	0	4	21	5	0	0	30
N	1m	74	50	*Lutjanus griseus*	0	0	0	14	3	0	0	17
N	1m	74	50	*Ocyurus chrysurus*	0	0	3	0	0	0	0	3
N	1m	75	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	75	10	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	1m	75	10	*Ocyurus chrysurus*	0	1	1	0	0	0	0	2
N	1m	75	10	*Scarus taeniopterus*	0	24	0	0	0	0	0	24
N	1m	75	20	*Lutjanus apodus*	0	0	0	4	1	0	0	5
N	1m	75	20	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	75	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	75	30	*Lutjanus apodus*	0	0	0	5	0	0	0	5
N	1m	75	30	*Lutjanus griseus*	0	0	0	18	4	0	0	22
N	1m	75	40	*Lutjanus apodus*	0	0	2	34	6	0	0	42
N	1m	75	40	*Lutjanus griseus*	0	0	0	9	2	0	0	11
N	1m	75	40	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	1m	75	40	*Scarus croicensis*	0	16	0	0	0	0	0	16
N	1m	75	50	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	75	50	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	1m	75	50	*Lutjanus apodus*	0	0	0	12	4	0	0	16
N	1m	75	50	*Lutjanus griseus*	0	0	0	10	0	0	0	10
N	1m	75	50	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2

N	1m	76	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	76	10	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	1m	76	10	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
N	1m	76	10	*Scarus taeniopterus*	0	12	0	0	0	0	0	12
N	1m	76	20	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	76	20	*Lutjanus apodus*	0	0	0	0	1	0	0	1
N	1m	76	20	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	1m	76	20	*Scarus taeniopterus*	0	7	0	0	0	0	0	7
N	1m	76	30	*Haemulon sciurus*	0	0	0	0	1	0	0	1
N	1m	76	30	*Lutjanus apodus*	0	0	0	4	0	0	0	4
N	1m	76	30	*Lutjanus griseus*	0	0	0	20	1	0	0	21
N	1m	76	30	*Scarus croicensis*	0	5	0	0	0	0	0	5
N	1m	76	30	*Sparisoma radians*	0	0	0	1	0	0	0	1
N	1m	76	40	*Haemulon sciurus*	0	0	0	11	0	0	0	11
N	1m	76	40	*Lutjanus apodus*	0	0	7	35	8	0	0	50
N	1m	76	40	*Lutjanus griseus*	0	0	0	11	5	0	0	16
N	1m	76	40	*Scarus croicensis*	0	16	0	0	0	0	0	16
N	1m	76	50	*Haemulon sciurus*	0	0	0	5	0	0	0	5
N	1m	76	50	*Lutjanus apodus*	0	0	0	12	2	0	0	14
N	1m	76	50	*Lutjanus griseus*	0	0	0	3	4	0	0	7
N	1m	76	50	*Ocyurus chrysurus*	0	0	3	2	2	0	0	7
N	1m	77	10	*Gerres cinereus*	0	0	0	2	0	0	0	2
N	1m	77	10	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	77	10	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	1m	77	10	*Sparisoma radians*	0	0	4	0	0	0	0	4
N	1m	77	20	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	1m	77	20	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	77	30	*Lutjanus apodus*	0	0	0	3	0	0	0	3
N	1m	77	30	*Lutjanus griseus*	0	0	0	10	6	0	0	16
N	1m	77	40	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	1m	77	40	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	77	40	*Lutjanus apodus*	0	0	0	39	6	0	0	45
N	1m	77	40	*Lutjanus griseus*	0	0	0	9	2	0	0	11
N	1m	77	40	*Ocyurus chrysurus*	0	0	5	0	0	0	0	5
N	1m	77	40	*Scarus croicensis*	0	11	0	0	0	0	0	11
N	1m	77	50	*Haemulon sciurus*	0	0	0	8	0	0	0	8
N	1m	77	50	*Lutjanus apodus*	0	0	0	11	1	0	0	12
N	1m	77	50	*Lutjanus griseus*	0	0	0	17	2	0	0	19
N	1m	77	50	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	1m	78	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	78	10	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	78	10	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
N	1m	78	10	*Scarus taeniopterus*	0	8	0	0	0	0	0	8
N	1m	78	10	*Sparisoma radians*	0	0	9	0	0	0	0	9
N	1m	78	20	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	78	20	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
N	1m	78	20	*Ocyurus chrysurus*	0	0	6	0	0	0	0	6
N	1m	78	20	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	1m	78	20	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	78	20	*Scarus taeniopterus*	0	16	0	0	0	0	0	16
N	1m	78	20	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	78	30	*Lutjanus apodus*	0	0	0	0	1	0	0	1
N	1m	78	30	*Lutjanus griseus*	0	0	0	0	1	0	0	1
N	1m	78	40	*Haemulon plumieri*	0	0	0	2	0	0	0	2
N	1m	78	40	*Haemulon sciurus*	0	0	0	24	0	0	0	24
N	1m	78	40	*Lutjanus apodus*	0	0	9	37	8	0	0	54
N	1m	78	40	*Lutjanus griseus*	0	0	0	7	2	0	0	9
N	1m	78	50	*Haemulon sciurus*	0	0	0	12	0	0	0	12
N	1m	78	50	*Lutjanus apodus*	0	0	0	21	0	0	0	21
N	1m	78	50	*Lutjanus griseus*	0	0	0	8	8	0	0	16
N	1m	78	50	*Ocyurus chrysurus*	0	0	4	0	0	0	0	4
N	1m	78	50	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	79	0	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	1m	79	30	*Lutjanus griseus*	0	0	0	1	0	0	0	1

N	1m	79	30	*Ocyurus chrysurus*	0	3	0	0	0	0	0	3
N	1m	79	30	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	1m	79	30	*Scarus croicensis*	0	8	0	0	0	0	0	8
N	1m	79	40	*Haemulon plumieri*	0	0	0	2	0	0	0	2
N	1m	79	40	*Haemulon sciurus*	0	0	4	10	1	0	0	15
N	1m	79	40	*Lutjanus apodus*	0	0	8	48	4	0	0	60
N	1m	79	40	*Lutjanus griseus*	0	0	0	6	6	0	0	12
N	1m	79	40	*Ocyurus chrysurus*	0	0	4	0	0	0	0	4
N	1m	79	50	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
N	1m	79	50	*Haemulon sciurus*	0	0	6	19	2	0	0	27
N	1m	79	50	*Lutjanus apodus*	0	0	2	19	2	0	0	23
N	1m	79	50	*Lutjanus griseus*	0	0	0	9	7	0	0	16
N	1m	79	50	*Ocyurus chrysurus*	0	0	8	1	0	0	0	9
N	1m	79	50	*Scarus croicensis*	0	8	0	0	0	0	0	8
N	1m	80	0	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	1m	80	0	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	80	10	*Sparisoma radians*	0	3	0	0	0	0	0	3
N	1m	80	20	*Gerres cinereus*	0	0	0	1	0	0	0	1
N	1m	80	20	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	80	30	*Lutjanus apodus*	0	0	1	0	0	0	0	1
N	1m	80	30	*Lutjanus griseus*	0	0	7	0	0	0	0	7
N	1m	80	40	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
N	1m	80	40	*Haemulon plumieri*	0	0	0	2	0	0	0	2
N	1m	80	40	*Haemulon sciurus*	0	0	0	19	0	0	0	19
N	1m	80	40	*Lutjanus apodus*	0	0	4	49	10	0	0	63
N	1m	80	40	*Lutjanus griseus*	0	0	0	8	11	0	0	19
N	1m	80	40	*Ocyurus chrysurus*	0	0	4	0	0	0	0	4
N	1m	80	40	*Scarus croicensis*	0	12	0	0	0	0	0	12
N	1m	80	40	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	80	50	*Haemulon sciurus*	0	0	0	19	4	0	0	23
N	1m	80	50	*Lutjanus apodus*	0	0	0	27	7	0	0	34
N	1m	80	50	*Lutjanus griseus*	0	0	0	8	10	0	0	18
N	1m	80	50	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
N	1m	80	50	*Ocyurus chrysurus*	0	0	5	1	0	0	0	6
N	1m	81	0	*Lutjanus griseus*	0	0	0	0	4	0	0	4
N	1m	81	10	*Eucinostomus jonesi*	0	16	0	0	0	0	0	16
N	1m	81	10	*Scarus taeniopterus*	0	21	0	0	0	0	0	21
N	1m	81	20	*Eucinostomus jonesi*	0	9	0	0	0	0	0	9
N	1m	81	20	*Haemulon sciurus*	0	0	0	4	0	0	0	4
N	1m	81	20	*Lutjanus apodus*	0	0	0	0	8	0	0	8
N	1m	81	20	*Lutjanus griseus*	0	0	0	0	7	0	0	7
N	1m	81	30	*Chaetodon capistratus*	1	0	0	0	0	0	0	1
N	1m	81	30	*Eucinostomus jonesi*	0	13	0	0	0	0	0	13
N	1m	81	30	*Lutjanus apodus*	0	0	0	0	8	0	0	8
N	1m	81	30	*Lutjanus griseus*	0	1	0	0	0	0	0	1
N	1m	81	30	*Scarus croicensis*	0	5	0	0	0	0	0	5
N	1m	81	40	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	81	40	*Lutjanus apodus*	0	0	0	0	2	0	0	2
N	1m	81	40	*Lutjanus griseus*	0	0	0	0	17	1	0	18
N	1m	81	50	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	81	50	*Lutjanus apodus*	0	0	0	0	25	0	0	25
N	1m	81	50	*Lutjanus griseus*	0	0	0	0	19	0	0	19
N	1m	81	50	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	1m	81	50	*Ocyurus chrysurus*	0	0	4	0	0	0	0	4
N	1m	81	50	*Scarus croicensis*	0	2	0	0	0	0	0	2
N	1m	82	0	*Lutjanus griseus*	0	0	0	3	0	0	0	3
N	1m	82	10	*Eucinostomus jonesi*	0	23	0	0	0	0	0	23
N	1m	82	10	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	82	10	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	82	10	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	82	10	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	1m	82	10	*Scarus taeniopterus*	0	26	0	0	0	0	0	26
N	1m	82	20	*Eucinostomus jonesi*	0	17	0	0	0	0	0	17
N	1m	82	20	*Haemulon sciurus*	0	0	0	2	0	0	0	2

N	1m	82	20	*Lutjanus apodus*	0	0	0	9	0	0	0	9
N	1m	82	20	*Lutjanus griseus*	0	0	0	7	0	0	0	7
N	1m	82	20	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
N	1m	82	20	*Sphoeroides testudineus*	0	0	0	1	0	0	0	1
N	1m	82	30	*Eucinostomus jonesi*	0	12	0	0	0	0	0	12
N	1m	82	30	*Lutjanus apodus*	0	0	0	4	0	0	0	4
N	1m	82	30	*Lutjanus griseus*	0	0	0	3	0	0	0	3
N	1m	82	30	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	1m	82	40	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	1m	82	40	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	82	40	*Lutjanus griseus*	0	0	0	12	2	0	0	14
N	1m	82	50	*Haemulon plumieri*	0	0	0	1	0	0	0	1
N	1m	82	50	*Haemulon sciurus*	0	0	0	6	0	0	0	6
N	1m	82	50	*Lutjanus apodus*	0	0	0	23	3	0	0	26
N	1m	82	50	*Lutjanus griseus*	0	0	0	16	4	0	0	20
N	1m	83	0	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	83	0	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	83	0	*Sphyraena barracuda*	0	0	0	1	0	0	0	1
N	1m	83	10	*Eucinostomus jonesi*	0	8	0	0	0	0	0	8
N	1m	83	10	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	83	10	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	1m	83	10	*Scarus taeniopterus*	0	12	0	0	0	0	0	12
N	1m	83	20	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
N	1m	83	20	*Eucinostomus jonesi*	0	21	0	0	0	0	0	21
N	1m	83	20	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	1m	83	20	*Lutjanus apodus*	0	0	0	12	0	0	0	12
N	1m	83	20	*Lutjanus griseus*	0	0	0	7	0	0	0	7
N	1m	83	20	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
N	1m	83	20	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	1m	83	30	*Eucinostomus jonesi*	0	4	0	0	0	0	0	4
N	1m	83	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	83	30	*Lutjanus apodus*	0	0	0	4	0	0	0	4
N	1m	83	30	*Lutjanus griseus*	0	0	0	5	0	0	0	5
N	1m	83	30	*Sparisoma radians*	0	1	0	0	0	0	0	1
N	1m	83	40	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	83	40	*Lutjanus apodus*	0	0	0	2	0	0	0	2
N	1m	83	40	*Lutjanus griseus*	0	0	0	13	1	0	0	14
N	1m	83	50	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	1m	83	50	*Lutjanus apodus*	0	0	0	24	9	0	0	33
N	1m	83	50	*Lutjanus griseus*	0	0	0	11	4	0	0	15
N	1m	83	50	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	1m	84	0	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	1m	84	0	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	84	0	*Sphyraena barracuda*	0	0	0	0	1	0	0	1
N	1m	84	10	*Eucinostomus jonesi*	0	16	0	0	0	0	0	16
N	1m	84	10	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	84	10	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	1m	84	10	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	1m	84	10	*Scarus taeniopterus*	0	6	0	0	0	0	0	6
N	1m	84	10	*Sphoeroides testudineus*	0	0	0	0	2	0	0	2
N	1m	84	20	*Eucinostomus jonesi*	0	15	0	0	0	0	0	15
N	1m	84	20	*Gerres cinereus*	0	0	2	0	0	0	0	2
N	1m	84	20	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	1m	84	20	*Lutjanus apodus*	0	0	0	11	0	0	0	11
N	1m	84	20	*Lutjanus griseus*	0	0	0	5	2	0	0	7
N	1m	84	20	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
N	1m	84	20	*Scarus taeniopterus*	0	12	0	0	0	0	0	12
N	1m	84	30	*Eucinostomus jonesi*	0	6	0	0	0	0	0	6
N	1m	84	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	84	30	*Lutjanus apodus*	0	0	0	4	0	0	0	4
N	1m	84	30	*Lutjanus griseus*	0	0	0	4	0	0	0	4
N	1m	84	30	*Scarus croicensis*	0	4	0	0	0	0	0	4
N	1m	84	30	*Sparisoma radians*	0	1	0	0	0	0	0	1
N	1m	84	40	*Gerres cinereus*	0	4	0	0	0	0	0	4

N	1m	84	40	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	84	40	*Lutjanus apodus*	0	0	0	2	0	0	0	2
N	1m	84	40	*Lutjanus griseus*	0	0	0	12	0	0	0	12
N	1m	84	50	*Haemulon sciurus*	0	0	0	5	0	0	0	5
N	1m	84	50	*Lutjanus apodus*	0	0	0	30	6	0	0	36
N	1m	84	50	*Lutjanus griseus*	0	0	0	13	4	0	0	17
N	1m	84	50	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	1m	84	50	*Scarus croicensis*	0	20	0	0	0	0	0	20
N	1m	85	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	85	10	*Acanthurus bahianus*	0	0	0	3	0	0	0	3
N	1m	85	10	*Eucinostomus jonesi*	0	15	0	0	0	0	0	15
N	1m	85	10	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	85	10	*Lutjanus griseus*	0	0	0	1	0	0	0	1
N	1m	85	10	*Sparisoma radians*	0	2	0	0	0	0	0	2
N	1m	85	20	*Chaetodon capistratus*	1	0	0	0	0	0	0	1
N	1m	85	20	*Eucinostomus jonesi*	0	5	0	0	0	0	0	5
N	1m	85	20	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	1m	85	20	*Lutjanus apodus*	0	0	0	9	0	0	0	9
N	1m	85	20	*Lutjanus griseus*	0	0	0	6	0	0	0	6
N	1m	85	20	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
N	1m	85	20	*Sparisoma radians*	0	25	0	0	0	0	0	25
N	1m	85	30	*Eucinostomus jonesi*	0	7	0	0	0	0	0	7
N	1m	85	30	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	85	30	*Lutjanus apodus*	0	0	0	5	0	0	0	5
N	1m	85	30	*Lutjanus griseus*	0	0	0	6	0	0	0	6
N	1m	85	30	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
N	1m	85	30	*Sparisoma radians*	0	2	0	0	0	0	0	2
N	1m	85	40	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	85	40	*Chaetodon capistratus*	1	0	0	0	0	0	0	1
N	1m	85	40	*Lutjanus apodus*	0	0	0	3	0	0	0	3
N	1m	85	40	*Lutjanus griseus*	0	0	0	13	0	0	0	13
N	1m	85	40	*Sparisoma radians*	0	1	0	0	0	0	0	1
N	1m	85	50	*Haemulon sciurus*	0	0	0	3	0	0	0	3
N	1m	85	50	*Lutjanus apodus*	0	0	0	21	6	0	0	27
N	1m	85	50	*Lutjanus griseus*	0	0	0	9	6	0	0	15
N	1m	85	50	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
N	1m	85	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	85	50	*Scarus croicensis*	0	25	0	0	0	0	0	25
N	1m	86	10	*Eucinostomus jonesi*	0	9	0	0	0	0	0	9
N	1m	86	10	*Haemulon sciurus*	0	0	0	4	3	0	0	7
N	1m	86	10	*Lutjanus apodus*	0	0	0	4	10	0	0	14
N	1m	86	10	*Lutjanus griseus*	0	0	0	2	3	0	0	5
N	1m	86	10	*Sphoeroides testudineus*	0	0	0	0	3	0	0	3
N	1m	86	20	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
N	1m	86	20	*Haemulon sciurus*	0	0	0	6	0	0	0	6
N	1m	86	20	*Lutjanus apodus*	0	0	0	16	2	0	0	18
N	1m	86	20	*Lutjanus griseus*	0	0	0	12	2	0	0	14
N	1m	86	20	*Mulliodichthys martinicus*	0	0	0	3	0	0	0	3
N	1m	86	20	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	1m	86	20	*Scarus taeniopterus*	0	17	0	0	0	0	0	17
N	1m	86	30	*Eucinostomus jonesi*	0	6	0	0	0	0	0	6
N	1m	86	30	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	86	30	*Lutjanus apodus*	0	0	0	2	0	0	0	2
N	1m	86	30	*Lutjanus griseus*	0	0	0	5	0	0	0	5
N	1m	86	30	*Scarus croicensis*	0	4	0	0	0	0	0	4
N	1m	86	30	*Sparisoma radians*	0	2	0	0	0	0	0	2
N	1m	86	40	*Chaetodon capistratus*	1	0	0	0	0	0	0	1
N	1m	86	40	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	86	40	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	86	40	*Lutjanus griseus*	0	1	0	11	0	0	0	12
N	1m	86	50	*Haemulon sciurus*	0	0	0	17	0	0	0	17
N	1m	86	50	*Lutjanus apodus*	0	0	0	28	0	0	0	28
N	1m	86	50	*Lutjanus griseus*	0	0	0	18	0	0	0	18
N	1m	86	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1

N	1m	86	50	*Scarus croicensis*	0	22	0	0	0	0	0	22
N	1m	86	50	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	1m	87	10	*Haemulon sciurus*	0	0	0	4	11	0	0	15
N	1m	87	10	*Lutjanus apodus*	0	0	0	0	4	0	0	4
N	1m	87	10	*Lutjanus griseus*	0	0	0	0	2	0	0	2
N	1m	87	10	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	1m	87	20	*Eucinostomus jonesi*	0	8	0	0	0	0	0	8
N	1m	87	20	*Haemulon sciurus*	0	0	0	7	0	0	0	7
N	1m	87	20	*Lutjanus apodus*	0	0	21	6	0	0	0	27
N	1m	87	20	*Lutjanus griseus*	0	0	0	15	3	0	0	18
N	1m	87	20	*Mulliodichthys martinicus*	0	0	2	3	0	0	0	5
N	1m	87	20	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	1m	87	20	*Scarus taeniopterus*	0	18	0	0	0	0	0	18
N	1m	87	30	*Eucinostomus jonesi*	0	6	0	0	0	0	0	6
N	1m	87	30	*Lutjanus apodus*	0	0	0	2	3	0	0	5
N	1m	87	30	*Lutjanus griseus*	0	0	0	6	0	0	0	6
N	1m	87	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	87	40	*Gerres cinereus*	0	5	0	0	0	0	0	5
N	1m	87	40	*Lutjanus griseus*	0	1	1	7	0	0	0	9
N	1m	87	40	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
N	1m	87	50	*Gerres cinereus*	0	1	0	0	0	0	0	1
N	1m	87	50	*Haemulon sciurus*	0	0	0	8	0	0	0	8
N	1m	87	50	*Lutjanus apodus*	0	0	0	27	4	0	0	31
N	1m	87	50	*Lutjanus griseus*	0	0	0	28	4	0	0	32
N	1m	87	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	87	50	*Scarus croicensis*	0	7	0	0	0	0	0	7
N	1m	87	50	*Scarus guacamaia*	0	0	0	1	0	0	0	1
N	1m	88	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
N	1m	88	10	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	88	10	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	88	10	*Lutjanus griseus*	0	0	0	3	0	0	0	3
N	1m	88	10	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	88	20	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
N	1m	88	20	*Haemulon sciurus*	0	0	0	10	0	0	0	10
N	1m	88	20	*Lutjanus apodus*	0	0	0	39	8	0	0	47
N	1m	88	20	*Lutjanus griseus*	0	0	0	14	0	0	0	14
N	1m	88	20	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	88	20	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	1m	88	20	*Scarus taeniopterus*	0	8	0	0	0	0	0	8
N	1m	88	20	*Sparisoma radians*	0	3	2	0	0	0	0	5
N	1m	88	30	*Haemulon sciurus*	0	0	0	7	0	0	0	7
N	1m	88	30	*Lutjanus apodus*	0	0	0	8	3	0	0	11
N	1m	88	30	*Lutjanus griseus*	0	0	0	8	4	0	0	12
N	1m	88	30	*Scarus guacamaia*	0	0	0	0	1	0	0	1
N	1m	88	40	*Lutjanus apodus*	0	0	0	1	3	0	0	4
N	1m	88	40	*Lutjanus griseus*	0	0	0	9	0	0	0	9
N	1m	88	40	*Mulliodichthys martinicus*	0	0	4	1	0	0	0	5
N	1m	88	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	88	40	*Scarus croicensis*	0	20	0	0	0	0	0	20
N	1m	88	40	*Sparisoma radians*	0	2	0	0	0	0	0	2
N	1m	88	50	*Chaetodon capistratus*	1	0	0	0	0	0	0	1
N	1m	88	50	*Lutjanus apodus*	0	0	0	29	2	0	0	31
N	1m	88	50	*Lutjanus griseus*	0	0	0	13	0	0	0	13
N	1m	88	50	*Scarus croicensis*	0	23	0	0	0	0	0	23
N	1m	88	50	*Sparisoma radians*	0	0	1	0	0	0	0	1
N	1m	89	0	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
N	1m	89	0	*Sphyraena barracuda*	0	0	0	1	0	0	0	1
N	1m	89	10	*Haemulon sciurus*	0	0	0	2	0	0	0	2
N	1m	89	10	*Lutjanus griseus*	0	0	0	3	1	0	0	4
N	1m	89	20	*Haemulon sciurus*	0	0	0	10	0	0	0	10
N	1m	89	20	*Lutjanus apodus*	0	0	0	25	5	0	0	30
N	1m	89	20	*Lutjanus griseus*	0	0	0	11	0	0	0	11
N	1m	89	20	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	89	20	*Scarus taeniopterus*	0	26	0	0	0	0	0	26

N	1m	89	20	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	89	30	*Haemulon sciurus*	0	0	0	6	0	0	0	6
N	1m	89	30	*Lutjanus apodus*	0	0	0	18	4	0	0	22
N	1m	89	30	*Lutjanus griseus*	0	0	0	12	3	0	0	15
N	1m	89	30	*Sparisoma radians*	0	0	2	0	0	0	0	2
N	1m	89	30	*Sphoeroides testudineus*	0	0	0	0	1	0	0	1
N	1m	89	40	*Lutjanus apodus*	0	0	0	8	0	0	0	8
N	1m	89	40	*Lutjanus griseus*	0	0	0	7	3	0	0	10
N	1m	89	40	*Mulliodichthys martinicus*	0	0	3	0	0	0	0	3
N	1m	89	40	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
N	1m	89	40	*Scarus coeruleus*	0	0	1	0	0	0	0	1
N	1m	89	40	*Scarus croicensis*	0	10	0	0	0	0	0	10
N	1m	89	50	*Haemulon sciurus*	0	0	0	12	0	0	0	12
N	1m	89	50	*Lutjanus apodus*	0	0	0	23	4	0	0	27
N	1m	89	50	*Lutjanus griseus*	0	0	0	14	3	0	0	17
N	1m	89	50	*Scarus croicensis*	0	15	0	0	0	0	0	15
N	1m	90	0	*Ocyurus chrysurus*	0	1	1	0	0	0	0	2
N	1m	90	10	*Haemulon sciurus*	0	0	0	1	0	0	0	1
N	1m	90	10	*Lutjanus apodus*	0	0	0	1	0	0	0	1
N	1m	90	10	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
N	1m	90	20	*Haemulon sciurus*	0	0	0	14	0	0	0	14
N	1m	90	20	*Lutjanus apodus*	0	0	0	22	0	0	0	22
N	1m	90	20	*Lutjanus griseus*	0	0	0	9	3	0	0	12
N	1m	90	20	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
N	1m	90	30	*Haemulon sciurus*	0	0	0	8	0	0	0	8
N	1m	90	30	*Lutjanus apodus*	0	0	0	18	3	0	0	21
N	1m	90	30	*Lutjanus griseus*	0	0	0	7	3	0	0	10
N	1m	90	30	*Mulliodichthys martinicus*	0	0	3	2	0	0	0	5
N	1m	90	30	*Scarus coeruleus*	0	0	2	0	0	0	0	2
N	1m	90	30	*Scarus croicensis*	0	9	0	0	0	0	0	9
N	1m	90	30	*Sparisoma radians*	0	2	3	0	0	0	0	5
N	1m	90	40	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
N	1m	90	40	*Lutjanus apodus*	0	0	0	8	2	0	0	10
N	1m	90	40	*Lutjanus griseus*	0	0	0	9	2	0	0	11
N	1m	90	40	*Scarus croicensis*	0	19	0	0	0	0	0	19
N	1m	90	50	*Haemulon sciurus*	0	0	0	12	0	0	0	12
N	1m	90	50	*Lutjanus apodus*	0	0	0	23	2	0	0	25
N	1m	90	50	*Lutjanus griseus*	0	0	0	16	0	0	0	16
N	1m	90	50	*Ocyurus chrysurus*	0	0	4	0	0	0	0	4
N	1m	90	50	*Scarus croicensis*	0	5	0	0	0	0	0	5
S	1m	91	30	*Lutjanus griseus*	0	0	0	0	1	0	0	1
S	1m	91	30	*Scarus taeniopterus*	4	0	0	0	0	0	0	4
S	1m	91	40	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	1m	91	40	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	1m	91	50	*Haemulon sciurus*	0	0	2	0	0	0	0	2
S	1m	91	50	*Lutjanus apodus*	0	0	0	3	0	0	0	3
S	1m	91	50	*Thalassoma bifasciatum*	0	0	1	0	0	0	0	1
S	1m	92	0	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	92	20	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	92	20	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	92	30	*Halichoeres maculipinna*	5	0	0	0	0	0	0	5
S	1m	92	30	*Scarus taeniopterus*	10	0	0	0	0	0	0	10
S	1m	92	30	*Thalassoma bifasciatum*	0	0	1	0	0	0	0	1
S	1m	92	40	*Haemulon sciurus*	0	0	5	0	0	0	0	5
S	1m	92	40	*Lutjanus apodus*	0	0	4	0	0	0	0	4
S	1m	92	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	92	50	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	1m	92	50	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	1m	92	50	*Lutjanus apodus*	0	0	1	3	0	0	0	4
S	1m	92	50	*Sparisoma radians*	0	2	0	0	0	0	0	2
S	1m	93	20	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	1m	93	20	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	93	30	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	93	30	*Haemulon sciurus*	0	0	2	0	0	0	0	2

S	1m	93	30	*Halichoeres maculipinna*	3	0	0	0	0	0	0	3
S	1m	93	30	*Scarus taeniopterus*	4	0	0	0	0	0	0	4
S	1m	93	40	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	1m	93	50	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	93	50	*Haemulon flavolineatum*	0	0	1	0	0	0	0	1
S	1m	93	50	*Haemulon sciurus*	0	0	3	0	0	0	0	3
S	1m	93	50	*Lutjanus apodus*	0	0	1	3	0	0	0	4
S	1m	93	50	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	94	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	94	0	*Lutjanus apodus*	0	0	2	0	0	0	0	2
S	1m	94	10	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	94	20	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	94	20	*Lutjanus apodus*	0	0	2	0	0	0	0	2
S	1m	94	30	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	1m	94	30	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	1m	94	30	*Halichoeres maculipinna*	5	0	0	0	0	0	0	5
S	1m	94	30	*Scarus taeniopterus*	2	0	0	0	0	0	0	2
S	1m	94	40	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	1m	94	50	*Haemulon sciurus*	0	0	3	0	0	0	0	3
S	1m	94	50	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	1m	94	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	94	50	*Sparisoma radians*	0	0	2	1	0	0	0	3
S	1m	95	20	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	95	20	*Mulliodichthys martinicus*	0	0	3	0	0	0	0	3
S	1m	95	30	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	1m	95	30	*Halichoeres maculipinna*	3	0	0	0	0	0	0	3
S	1m	95	30	*Scarus taeniopterus*	5	0	0	0	0	0	0	5
S	1m	95	50	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	1m	95	50	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	95	50	*Sparisoma radians*	0	0	3	1	0	0	0	4
S	1m	96	0	*Mulliodichthys martinicus*	0	0	5	0	0	0	0	5
S	1m	96	10	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	1m	96	10	*Lutjanus griseus*	0	0	0	5	0	0	0	5
S	1m	96	20	*Haemulon parrai*	0	0	6	2	0	0	0	8
S	1m	96	20	*Haemulon sciurus*	0	0	13	3	0	0	0	16
S	1m	96	20	*Lutjanus apodus*	0	0	0	14	2	0	0	16
S	1m	96	20	*Lutjanus griseus*	0	0	0	8	0	0	0	8
S	1m	96	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	96	30	*Haemulon flavolineatum*	0	0	2	0	0	0	0	2
S	1m	96	30	*Haemulon parrai*	0	0	0	2	0	0	0	2
S	1m	96	30	*Haemulon plumieri*	0	0	2	0	0	0	0	2
S	1m	96	30	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	1m	96	30	*Halichoeres maculipinna*	4	0	0	0	0	0	0	4
S	1m	96	30	*Lutjanus apodus*	0	0	0	0	8	4	0	12
S	1m	96	30	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	96	30	*Scarus taeniopterus*	5	0	0	0	0	0	0	5
S	1m	96	40	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	1m	96	40	*Haemulon parrai*	0	0	0	4	0	0	0	4
S	1m	96	40	*Haemulon sciurus*	0	0	17	0	0	0	0	17
S	1m	96	40	*Lutjanus apodus*	0	0	0	20	4	0	0	24
S	1m	96	40	*Lutjanus griseus*	0	0	0	7	3	0	0	10
S	1m	96	50	*Haemulon parrai*	0	0	2	4	0	0	0	6
S	1m	96	50	*Haemulon sciurus*	0	0	18	2	0	0	0	20
S	1m	96	50	*Lutjanus apodus*	0	0	12	8	2	0	0	22
S	1m	96	50	*Lutjanus griseus*	0	0	0	4	2	0	0	6
S	1m	97	0	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	97	20	*Haemulon sciurus*	0	0	6	0	0	0	0	6
S	1m	97	20	*Lutjanus apodus*	0	0	0	0	1	0	0	1
S	1m	97	30	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	1m	97	30	*Epinephelus striatus*	0	0	0	1	0	0	0	1
S	1m	97	30	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	1m	97	30	*Halichoeres maculipinna*	3	0	0	0	0	0	0	3
S	1m	97	30	*Lutjanus apodus*	0	0	0	15	2	0	0	17
S	1m	97	30	*Scarus taeniopterus*	4	0	0	0	0	0	0	4

S	1m	97	30	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	97	30	*Thalassoma bifasciatum*	0	0	3	0	0	0	0	3
S	1m	97	40	*Calamus bajonado*	0	0	3	0	0	0	0	3
S	1m	97	40	*Haemulon sciurus*	0	0	3	0	0	0	0	3
S	1m	97	40	*Lutjanus apodus*	0	0	0	8	2	0	0	10
S	1m	97	40	*Lutjanus griseus*	0	0	0	4	0	0	0	4
S	1m	97	40	*Sparisoma viride*	0	0	0	1	0	0	0	1
S	1m	97	50	*Haemulon sciurus*	0	0	16	4	0	0	0	20
S	1m	97	50	*Lutjanus apodus*	0	0	4	12	2	0	0	18
S	1m	97	50	*Lutjanus griseus*	0	0	0	2	1	0	0	3
S	1m	98	0	*Gerres cinereus*	0	0	3	0	0	0	0	3
S	1m	98	10	*Lutjanus apodus*	0	0	2	0	0	0	0	2
S	1m	98	20	*Haemulon sciurus*	0	0	5	0	0	0	0	5
S	1m	98	20	*Lutjanus apodus*	0	0	1	1	0	0	0	2
S	1m	98	20	*Lutjanus griseus*	0	0	0	1	0	0	0	1
S	1m	98	30	*Epinephelus striatus*	0	0	0	1	0	0	0	1
S	1m	98	30	*Haemulon sciurus*	0	0	6	0	0	0	0	6
S	1m	98	30	*Kyphosus sectatrix*	0	0	0	0	1	0	0	1
S	1m	98	30	*Lutjanus apodus*	0	0	0	8	4	0	0	12
S	1m	98	30	*Ocyurus chrysurus*	0	2	0	0	0	0	0	2
S	1m	98	30	*Sparisoma radians*	0	0	6	0	0	0	0	6
S	1m	98	30	*Thalassoma bifasciatum*	0	0	3	0	0	0	0	3
S	1m	98	40	*Haemulon parrai*	0	0	3	0	0	0	0	3
S	1m	98	40	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	1m	98	40	*Lutjanus apodus*	0	0	0	10	2	0	0	12
S	1m	98	40	*Lutjanus griseus*	0	0	0	2	0	0	0	2
S	1m	98	50	*Haemulon sciurus*	0	0	10	0	0	0	0	10
S	1m	98	50	*Lutjanus apodus*	0	0	3	9	2	0	0	14
S	1m	99	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	99	20	*Calamus bajonado*	0	0	3	0	0	0	0	3
S	1m	99	20	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	1m	99	20	*Lutjanus apodus*	0	0	0	4	0	0	0	4
S	1m	99	20	*Lutjanus griseus*	0	0	0	4	1	0	0	5
S	1m	99	20	*Mulliodichthys martinicus*	0	0	4	0	0	0	0	4
S	1m	99	30	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	1m	99	30	*Lutjanus apodus*	0	0	0	9	2	0	0	11
S	1m	99	30	*Lutjanus griseus*	0	0	0	2	2	0	0	4
S	1m	99	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	99	30	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	1m	99	40	*Abudefduf saxatilis*	2	0	0	0	0	0	0	2
S	1m	99	40	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	1m	99	40	*Epinephelus striatus*	0	0	0	1	0	0	0	1
S	1m	99	40	*Haemulon sciurus*	0	0	6	0	0	0	0	6
S	1m	99	40	*Lutjanus apodus*	0	0	0	8	0	0	0	8
S	1m	99	40	*Lutjanus griseus*	0	0	0	4	0	0	0	4
S	1m	99	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	99	50	*Haemulon sciurus*	0	0	12	8	0	0	0	20
S	1m	99	50	*Lutjanus apodus*	0	0	0	9	0	0	0	9
S	1m	100	20	*Caranx latus*	0	0	1	0	0	0	0	1
S	1m	100	20	*Haemulon sciurus*	0	0	12	0	0	0	0	12
S	1m	100	20	*Lutjanus apodus*	0	0	4	5	0	0	0	9
S	1m	100	20	*Lutjanus griseus*	0	0	0	0	2	0	0	2
S	1m	100	20	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
S	1m	100	30	*Haemulon sciurus*	0	0	4	0	0	0	0	4
S	1m	100	30	*Halichoeres maculipinna*	2	0	0	0	0	0	0	2
S	1m	100	30	*Lutjanus apodus*	0	0	0	14	4	0	0	18
S	1m	100	30	*Lutjanus griseus*	0	0	0	7	0	0	0	7
S	1m	100	30	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	100	30	*Pomacanthus arcuatus*	0	0	0	1	0	0	0	1
S	1m	100	30	*Thalassoma bifasciatum*	0	0	3	0	0	0	0	3
S	1m	100	40	*Calamus bajonado*	0	0	2	0	0	0	0	2
S	1m	100	40	*Epinephelus striatus*	0	0	0	1	0	0	0	1
S	1m	100	40	*Haemulon sciurus*	0	0	8	0	0	0	0	8
S	1m	100	40	*Lutjanus apodus*	0	0	0	7	0	0	0	7

S	1m	100	40	*Lutjanus griseus*	0	0	0	7	0	0	0	7
S	1m	100	40	*Thalassoma bifasciatum*	0	0	3	0	0	0	0	3
S	1m	100	50	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	1m	100	50	*Haemulon sciurus*	0	0	8	2	0	0	0	10
S	1m	100	50	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	1m	100	50	*Lutjanus apodus*	0	0	0	15	4	0	0	19
S	1m	100	50	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	101	30	*Acanthurus bahianus*	0	0	0	1	0	0	0	1
S	1m	101	30	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	1m	101	30	*Lutjanus apodus*	0	0	0	10	0	0	0	10
S	1m	101	30	*Mulliodichthys martinicus*	0	0	2	4	0	0	0	6
S	1m	101	30	*Ocyurus chrysurus*	0	0	1	1	0	0	0	2
S	1m	101	40	*Kyphosus sectatrix*	0	0	0	1	0	0	0	1
S	1m	101	40	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	101	50	*Halichoeres maculipinna*	4	0	0	0	0	0	0	4
S	1m	101	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	101	50	*Scarus taeniopterus*	3	0	0	0	0	0	0	3
S	1m	101	50	*Sparisoma radians*	0	0	0	1	0	0	0	1
S	1m	102	10	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	1m	102	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	102	10	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
S	1m	102	20	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	102	30	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	1m	102	30	*Ocyurus chrysurus*	0	0	1	1	0	0	0	2
S	1m	102	50	*Halichoeres maculipinna*	4	0	0	0	0	0	0	4
S	1m	102	50	*Scarus taeniopterus*	4	1	0	0	0	0	0	5
S	1m	103	0	*Mulliodichthys martinicus*	0	3	0	0	0	0	0	3
S	1m	103	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	103	20	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	103	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	103	30	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
S	1m	103	40	*Haemulon sciurus*	0	0	0	9	0	0	0	9
S	1m	103	40	*Lutjanus apodus*	0	0	0	3	0	0	0	3
S	1m	103	40	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
S	1m	103	50	*Abudefduf saxatilis*	1	1	0	0	0	0	0	2
S	1m	103	50	*Halichoeres maculipinna*	5	0	0	0	0	0	0	5
S	1m	103	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	103	50	*Scarus taeniopterus*	4	0	0	0	0	0	0	4
S	1m	104	0	*Gerres cinereus*	0	0	3	0	0	0	0	3
S	1m	104	10	*Gerres cinereus*	0	1	3	0	0	0	0	4
S	1m	104	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	104	30	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
S	1m	104	40	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	1m	104	40	*Halichoeres maculipinna*	0	2	0	0	0	0	0	2
S	1m	104	40	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	104	40	*Mulliodichthys martinicus*	0	0	3	0	0	0	0	3
S	1m	104	40	*Ocyurus chrysurus*	0	0	1	1	0	0	0	2
S	1m	104	50	*Abudefduf saxatilis*	1	1	0	0	0	0	0	2
S	1m	104	50	*Halichoeres maculipinna*	1	0	0	0	0	0	0	1
S	1m	104	50	*Scarus taeniopterus*	5	0	0	0	0	0	0	5
S	1m	105	0	*Gerres cinereus*	0	0	4	0	0	0	0	4
S	1m	105	20	*Thalassoma bifasciatum*	0	0	0	1	0	0	0	1
S	1m	105	30	*Haemulon sciurus*	0	0	2	0	0	0	0	2
S	1m	105	30	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	1m	105	40	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	1m	105	40	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
S	1m	105	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	105	50	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	105	50	*Halichoeres maculipinna*	1	2	0	0	0	0	0	3
S	1m	105	50	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	105	50	*Scarus taeniopterus*	4	0	0	0	0	0	0	4
S	1m	106	0	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	106	10	*Gerres cinereus*	0	0	3	0	0	0	0	3
S	1m	106	10	*Lutjanus apodus*	0	0	2	0	0	0	0	2

S	1m	106	30	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	106	30	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	1m	106	30	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	106	30	*Mulliodichthys martinicus*	0	0	3	1	0	0	0	4
S	1m	106	30	*Ocyurus chrysurus*	0	0	1	1	0	0	0	2
S	1m	106	30	*Thalassoma bifasciatum*	0	0	0	1	0	0	0	1
S	1m	106	40	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	106	40	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	106	40	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	106	50	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	106	50	*Halichoeres maculipinna*	0	2	0	0	0	0	0	2
S	1m	107	10	*Calamus bajonado*	0	0	0	2	0	0	0	2
S	1m	107	10	*Gerres cinereus*	0	0	8	0	0	0	0	8
S	1m	107	10	*Mulliodichthys martinicus*	0	0	0	1	0	0	0	1
S	1m	107	30	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	1m	107	30	*Mulliodichthys martinicus*	0	0	3	3	0	0	0	6
S	1m	107	30	*Thalassoma bifasciatum*	0	0	0	1	0	0	0	1
S	1m	107	40	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	107	40	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	107	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	107	50	*Abudefduf saxatilis*	1	2	0	0	0	0	0	3
S	1m	107	50	*Scarus taeniopterus*	5	0	0	0	0	0	0	5
S	1m	107	50	*Sparisoma viride*	1	0	0	0	0	0	0	1
S	1m	107	50	*Sphoeroides testudineus*	0	3	0	0	0	0	0	3
S	1m	108	0	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	108	10	*Gerres cinereus*	0	0	5	0	0	0	0	5
S	1m	108	10	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	1m	108	10	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	108	10	*Thalassoma bifasciatum*	0	0	1	0	0	0	0	1
S	1m	108	20	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
S	1m	108	30	*Mulliodichthys martinicus*	0	0	3	3	0	0	0	6
S	1m	108	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	108	30	*Thalassoma bifasciatum*	0	0	0	1	0	0	0	1
S	1m	108	40	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	108	50	*Halichoeres maculipinna*	1	2	0	0	0	0	0	3
S	1m	108	50	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	108	50	*Scarus taeniopterus*	5	1	0	0	0	0	0	6
S	1m	108	50	*Sparisoma viride*	1	0	0	0	0	0	0	1
S	1m	109	10	*Calamus bajonado*	0	0	1	0	0	0	0	1
S	1m	109	10	*Gerres cinereus*	0	0	4	0	0	0	0	4
S	1m	109	10	*Mulliodichthys martinicus*	0	0	3	1	0	0	0	4
S	1m	109	10	*Thalassoma bifasciatum*	0	0	0	1	0	0	0	1
S	1m	109	20	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
S	1m	109	20	*Thalassoma bifasciatum*	0	0	1	0	0	0	0	1
S	1m	109	30	*Haemulon parrai*	0	0	0	5	0	0	0	5
S	1m	109	30	*Haemulon sciurus*	0	0	0	12	0	0	0	12
S	1m	109	30	*Lutjanus apodus*	0	0	0	7	0	0	0	7
S	1m	109	30	*Mulliodichthys martinicus*	0	0	2	3	0	0	0	5
S	1m	109	40	*Abudefduf saxatilis*	0	1	0	0	0	0	0	1
S	1m	109	40	*Haemulon parrai*	0	0	0	5	0	0	0	5
S	1m	109	40	*Haemulon sciurus*	0	0	0	24	0	0	0	24
S	1m	109	50	*Abudefduf saxatilis*	1	1	0	0	0	0	0	2
S	1m	109	50	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	1m	109	50	*Scarus taeniopterus*	5	0	0	0	0	0	0	5
S	1m	110	10	*Haemulon sciurus*	0	0	1	0	0	0	0	1
S	1m	110	10	*Lutjanus apodus*	0	0	1	0	0	0	0	1
S	1m	110	10	*Mulliodichthys martinicus*	0	0	4	0	0	0	0	4
S	1m	110	10	*Thalassoma bifasciatum*	0	0	1	0	0	0	0	1
S	1m	110	20	*Haemulon sciurus*	0	0	5	0	0	0	0	5
S	1m	110	20	*Kyphosus sectatrix*	0	0	0	2	0	0	0	2
S	1m	110	20	*Lutjanus apodus*	0	0	0	8	2	0	0	10
S	1m	110	20	*Lutjanus griseus*	0	0	0	3	0	0	0	3
S	1m	110	20	*Ocyurus chrysurus*	0	1	0	0	0	0	0	1
S	1m	110	30	*Haemulon sciurus*	0	0	0	3	0	0	0	3

S	1m	110	30	*Lutjanus apodus*	0	0	0	3	0	0	0	3
S	1m	110	40	*Abudefduf saxatilis*	0	2	0	0	0	0	0	2
S	1m	110	40	*Haemulon parrai*	0	0	2	0	0	0	0	2
S	1m	110	40	*Haemulon sciurus*	0	0	0	10	2	0	0	12
S	1m	110	40	*Lutjanus apodus*	0	0	4	42	4	0	0	50
S	1m	110	40	*Lutjanus griseus*	0	0	0	4	2	0	0	6
S	1m	110	40	*Mulliodichthys martinicus*	0	0	3	0	0	0	0	3
S	1m	110	40	*Ocyurus chrysurus*	0	0	2	0	0	0	0	2
S	1m	110	50	*Abudefduf saxatilis*	1	2	0	0	0	0	0	3
S	1m	110	50	*Haemulon flavolineatum*	0	0	0	1	0	0	0	1
S	1m	110	50	*Haemulon sciurus*	0	0	0	10	0	0	0	10
S	1m	110	50	*Halichoeres maculipinna*	0	3	0	0	0	0	0	3
S	1m	110	50	*Scarus taeniopterus*	5	0	0	0	0	0	0	5
S	1m	110	50	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	111	10	*Gerres cinereus*	0	0	3	0	0	0	0	3
S	1m	111	10	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	111	20	*Lutjanus apodus*	0	0	0	3	0	0	0	3
S	1m	111	30	*Haemulon sciurus*	0	0	0	4	0	0	0	4
S	1m	111	30	*Lutjanus apodus*	0	0	0	6	3	0	0	9
S	1m	111	40	*Haemulon sciurus*	0	0	0	4	0	0	0	4
S	1m	111	40	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	111	50	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	111	50	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	1m	112	10	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	112	10	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	112	20	*Diodon hystrix*	0	0	0	0	1	0	0	1
S	1m	112	30	*Haemulon sciurus*	0	0	0	4	0	0	0	4
S	1m	112	30	*Lutjanus apodus*	0	0	0	12	0	0	0	12
S	1m	112	40	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	112	50	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
S	1m	112	50	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	1m	113	0	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	113	10	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	1m	113	10	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	1m	113	10	*Mulliodichthys martinicus*	0	0	1	1	0	0	0	2
S	1m	113	10	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	113	20	*Acanthurus bahianus*	0	0	2	0	0	0	0	2
S	1m	113	20	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	113	20	*Sparisoma radians*	0	0	3	0	0	0	0	3
S	1m	113	20	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	113	30	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	1m	113	30	*Lutjanus apodus*	0	0	0	16	1	0	0	17
S	1m	113	40	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	113	40	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	113	40	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	113	50	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
S	1m	113	50	*Lutjanus apodus*	0	0	0	2	0	0	0	2
S	1m	114	10	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	114	10	*Mulliodichthys martinicus*	0	0	2	0	0	0	0	2
S	1m	114	10	*Scarus coeruleus*	0	0	1	0	0	0	0	1
S	1m	114	10	*Sparisoma radians*	0	2	0	0	0	0	0	2
S	1m	114	20	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	114	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	114	30	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	1m	114	30	*Lutjanus apodus*	0	0	0	16	0	0	0	16
S	1m	114	30	*Mulliodichthys martinicus*	0	0	3	2	0	0	0	5
S	1m	114	30	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	114	40	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	114	40	*Lutjanus apodus*	0	0	0	5	0	0	0	5
S	1m	114	50	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	115	0	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	115	10	*Abudefduf saxatilis*	1	0	0	0	0	0	0	1
S	1m	115	10	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	115	20	*Sphyraena barracuda*	0	0	0	0	0	0	1	1

S	1m	115	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	115	30	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	1m	115	30	*Lutjanus apodus*	0	0	0	15	0	0	0	15
S	1m	115	30	*Mulliodichthys martinicus*	0	0	3	0	0	0	0	3
S	1m	115	40	*Lutjanus apodus*	0	0	0	5	0	0	0	5
S	1m	115	50	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
S	1m	116	0	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	116	10	*Mulliodichthys martinicus*	0	0	1	0	0	0	0	1
S	1m	116	10	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	116	10	*Sparisoma radians*	0	1	2	0	0	0	0	3
S	1m	116	20	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	116	20	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	116	30	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	1m	116	30	*Lutjanus apodus*	0	0	0	13	2	0	0	15
S	1m	116	30	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	116	40	*Haemulon sciurus*	0	0	0	3	0	0	0	3
S	1m	116	40	*Lutjanus apodus*	0	0	0	9	0	0	0	9
S	1m	116	50	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
S	1m	116	50	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	117	10	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	117	10	*Scarus coeruleus*	0	0	1	0	0	0	0	1
S	1m	117	10	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	117	20	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	117	30	*Haemulon sciurus*	0	0	0	5	0	0	0	5
S	1m	117	30	*Lutjanus apodus*	0	0	0	17	1	0	0	18
S	1m	117	30	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	1m	117	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	117	40	*Haemulon sciurus*	0	0	0	4	0	0	0	4
S	1m	117	40	*Lutjanus apodus*	0	0	0	7	0	0	0	7
S	1m	117	40	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	117	50	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
S	1m	117	50	*Lutjanus apodus*	0	0	0	1	0	0	0	1
S	1m	118	10	*Gerres cinereus*	0	0	1	0	0	0	0	1
S	1m	118	10	*Haemulon sciurus*	0	0	0	2	0	0	0	2
S	1m	118	10	*Scarus coeruleus*	0	0	1	0	0	0	0	1
S	1m	118	10	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	118	20	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	118	30	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	118	30	*Haemulon sciurus*	0	0	0	13	0	0	0	13
S	1m	118	30	*Lutjanus apodus*	0	0	0	19	2	0	0	21
S	1m	118	30	*Mulliodichthys martinicus*	0	0	3	1	0	0	0	4
S	1m	118	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	118	40	*Calamus bajonado*	0	0	0	2	0	0	0	2
S	1m	118	40	*Haemulon sciurus*	0	0	0	8	0	0	0	8
S	1m	118	40	*Lutjanus apodus*	0	0	0	6	0	0	0	6
S	1m	118	40	*Sparisoma radians*	0	0	2	0	0	0	0	2
S	1m	118	50	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
S	1m	119	0	*Ocyurus chrysurus*	0	0	1	0	0	0	0	1
S	1m	119	10	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	119	10	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	119	10	*Sparisoma radians*	0	0	1	0	0	0	0	1
S	1m	119	20	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	119	30	*Haemulon sciurus*	0	0	0	14	0	0	0	14
S	1m	119	30	*Lutjanus apodus*	0	0	0	18	2	0	0	20
S	1m	119	30	*Mulliodichthys martinicus*	0	0	0	2	0	0	0	2
S	1m	119	40	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	119	40	*Haemulon sciurus*	0	0	0	6	0	0	0	6
S	1m	119	40	*Lutjanus apodus*	0	0	0	8	0	0	0	8
S	1m	119	50	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
S	1m	120	10	*Haemulon sciurus*	0	0	0	1	0	0	0	1
S	1m	120	20	*Sphyraena barracuda*	0	0	0	0	0	0	1	1
S	1m	120	30	*Haemulon sciurus*	0	0	0	20	0	0	0	20
S	1m	120	30	*Lutjanus apodus*	0	0	0	28	0	0	0	28
S	1m	120	30	*Mulliodichthys martinicus*	0	0	4	1	0	0	0	5

S	1m	120	40	*Haemulon sciurus*	0	0	0	14	0	0	0	14
S	1m	120	40	*Lutjanus apodus*	0	0	0	12	0	0	0	12
S	1m	120	40	*Ocyurus chrysurus*	0	0	0	1	0	0	0	1
S	1m	120	50	*Acanthurus bahianus*	0	0	1	0	0	0	0	1
S	1m	120	50	*Lactophrys triqueter*	0	0	0	1	0	0	0	1
S	1m	120	50	*Scarus guacamaia*	0	0	0	0	2	0	0	2
					621	1241	4678	6514	1294	12	17	14373

Appendix VI – Construction of Artificial Mangrove Units

PVC piping that formed the top of each Unit was constructed in a matrix for strength using a series of 3.17 cm PVC crosses, elbows and Ts. These were secured using 25mm stainless steel screws. Five 160cm lengths were used as legs, one at each corner of the unit and one placed centrally. Once the frame of the AMU had holes drilled in it to allow air to escape, the legs were easily pushed into the lagoon sand/mud to hold the unit in place without other means of anchorage. Eight hundred metres of 2.54 cm (OD – outside diameter) and two hundred metres of 1.27 cm (OD) black irrigation hose was cut to form artificial mangrove roots which were attached to the top of the AMU frame in a random pattern using stainless steel screws. The roots were made more life-like by partially slicing one long piece (~1m) of hose at an angle so that another piece of hose could be forced into the slice and attached using a 25mm stainless steel screw and washer. This was done two to four times on each root length. During pilot studies to determine if fish were attracted to the artificial units, coconut palm frond canopies were laid on top of the AMUs and held in place with galvanised wire. For the actual field experiments UV resistant polypropylene shade cloth (as used in horticulture) was utilised. The Lumite® cloth was manufactured with different shade properties including 30%, 51%, 63% and 73% light exclusion, and a 90% light exclusion was created by layering a 63% on a 73% piece. Cloth was cut to size and stretched over a $2m^{-2}$ frame constructed with 2m x 40mm x 10 mm lengths of wood. The frame was strengthened at the corners by cutting right angled sheet aluminium triangles and screwing them to the wood over the corner joint. The cloth was secured using 12mm stainless steel staples, and another wooden frame was placed over the first to sandwich the cloth into place and to add additional strength. Ten shade frames

were constructed, two of each light exclusion value. The frames were attached to the PVC AMU frame using 35mm stainless steel screws.

Figure A6: PVC frame construction of Artificial Mangrove Unit (AMU), with black irrigation hose for the roots. When placed in the field, the legs of the AMUs were approximately 1.6m in length so that 0.4m could be pushed into the mud to anchor the unit.

Light Measurements made below Fouled Artificial Mangrove Canopies.

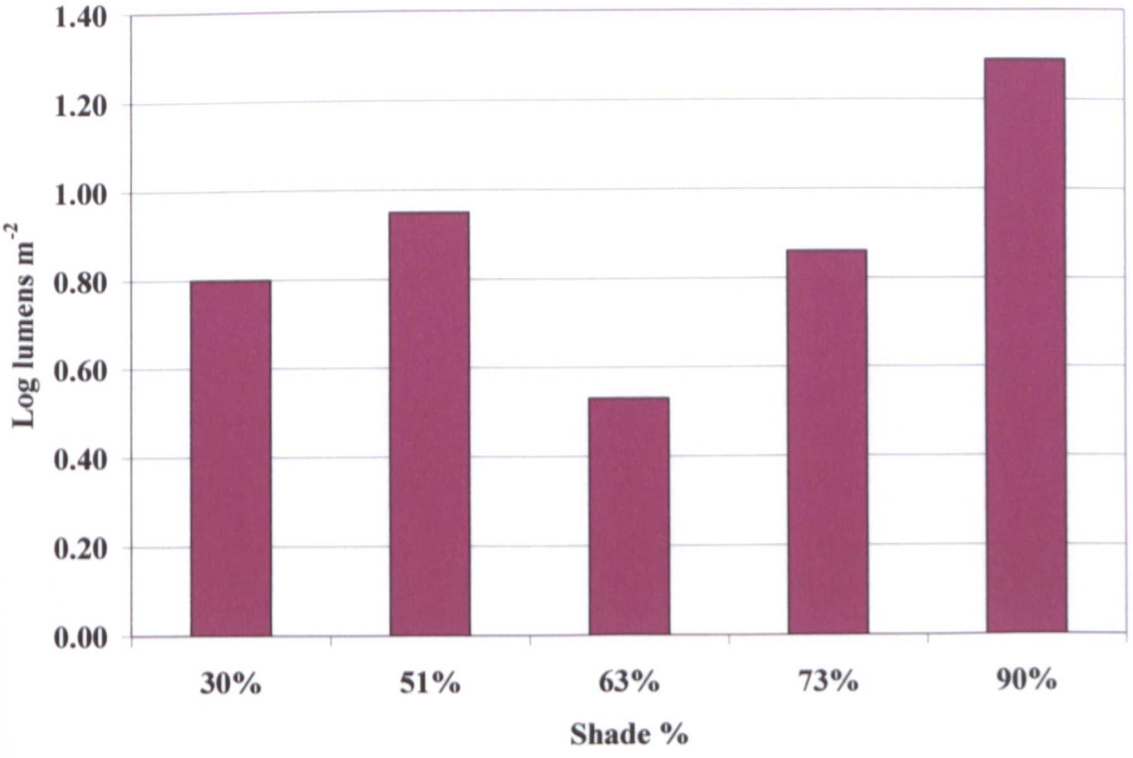

Figure A7: Light exclusion from AMU canopies fouled with calcium carbonate sediment. Fouling appeared only to affect the 30 and 51% shade fabric.

Following shade experiment manipulations, fouled canopies were tested to determine how much light passed through them. An Onset® Hobo Light Intensity Logger was placed below each canopy, one after the other, in a blacked out room. A high powered halogen light source was pointed directly down on each canopy and light intensity was recorded every 5 seconds for 2 minutes below the canopy. Figure A6 (above) indicates how much light each canopy excluded. Shades 30 and 51 were most similar to that of 73% varying only by 0.06 and 0.09 log lumens m^{-2} respectively.